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Popular Woodworking

Issue #79 July 1994

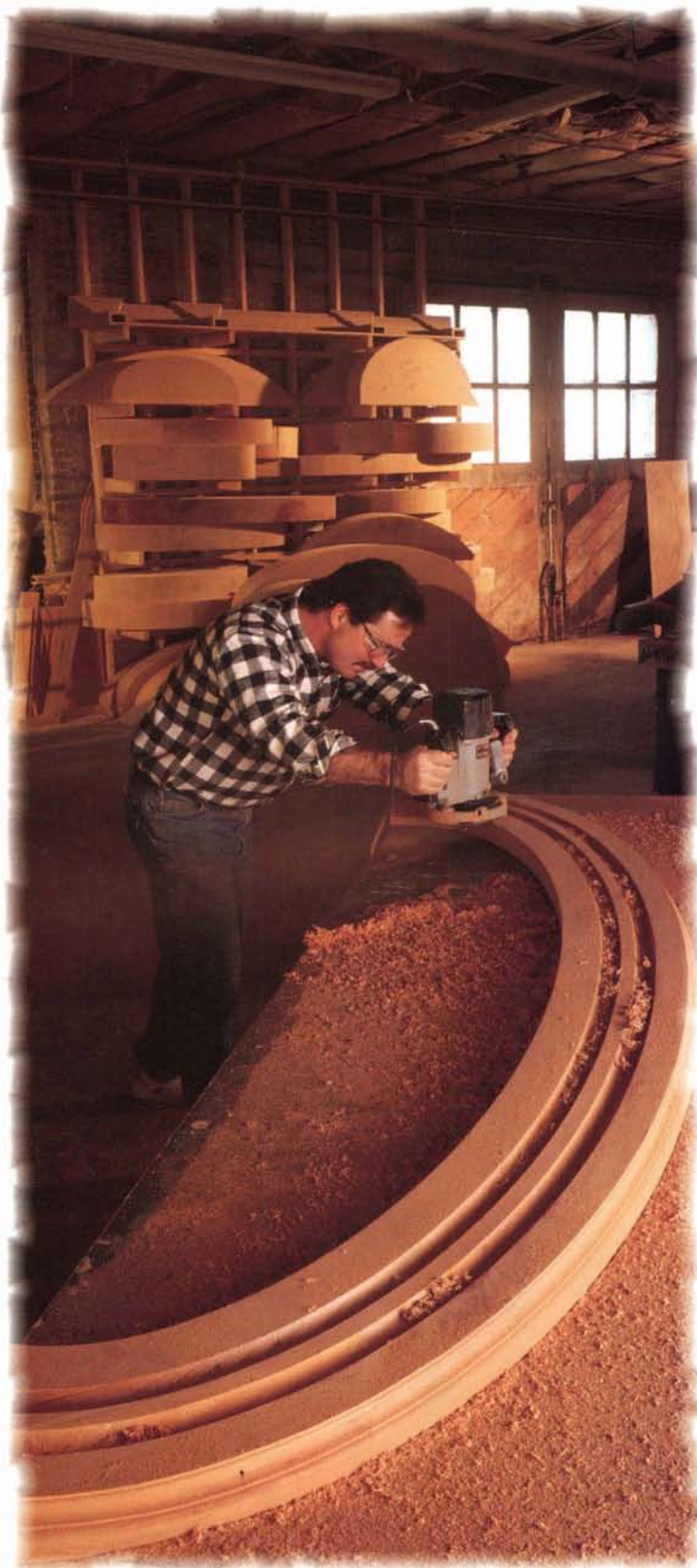
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Cut It



Wood Strokes Magazine

From Pattern To Paint... We'll Fill In The Blanks!



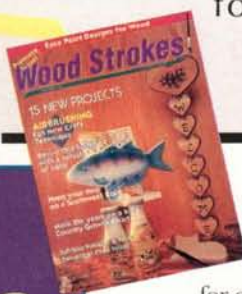
Paint it



Show it

Easy as 1-2-3, craft painting's new *Wood Strokes* magazine is packed with fun new paint designs for wood. Clearly illustrated with full color, step-by-step photographs, each issue is filled with projects to cut out or, if you prefer, order our ready-cut project blanks. All you have to do is add paint!

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To carry *Popular Woodworking* in your store, call Harold Radin at (510) 671-9852 x 207, or write Store Sales, 1041 Shary Circle, Concord, CA 94518.

Popular Woodworking (ISSN 0884-8823) is published bimonthly by EGW Publishing Co., 1041 Shary Circle, Concord, CA 94518. Second-class postage paid at Concord, California and additional mailing offices. POSTMASTER: send address changes to *Popular Woodworking*, Box 58279, Boulder, CO 80322-8279.

SUBSCRIPTIONS: A year's subscription (6 issues) is \$27; two years' worth (12 issues) is \$54; outside of U.S.A. add \$6.00/year. Send to: *Popular Woodworking*, Box 58279, Boulder, CO 80322-8279. Please allow 6 to 8 weeks for delivery.

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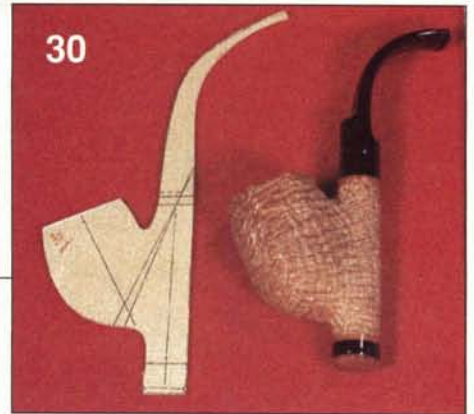
On the Cover

I met Paul Spinetti at the December, 1992 meeting of the Bay Area Woodturners in Alameda, California. I'd gone to the gathering to see what kinds of new things I could learn. The meeting turned out to be a juried competition of the members' best work. Paul won best of show with a spectacular turning. I asked him what he does for a living, and you guessed it—he turns. For the full story see The Tool Wright's Corner on page 76.



Gary Wagner, San Francisco, California

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Woodworking Kits



There's another wholly different category of woodworking projects out there that may interest you—kits. There are kits available for just about every type of woodworking interest—from flyable aircraft, antique furniture, toys and doll houses, to musical instruments, tools, replicas and boats. Some are easy to construct, others are as difficult as they come.

The one thing they have in common is the availability of pre-cut wooden parts. Sometimes it seems that cutting out the parts is the easiest part of a project and assembly and finishing are where the challenges lie. In others, we may have a project that we really want to build, but don't have the tools or skills to make some of the components.

There's a large community of woodworkers who enjoy these types of projects and a skilled group of designers and fabricators who test, assemble and produce these kits.

In this issue we'd like to present the first in a series of reviews. If you like spending time around and on the

water, you might want to check out the three small boat kits beginning on page 55 that photographer Allen Shain and I put together.

The boats arrived here at our shop last October, and by the end of March all three were in the water. It didn't take that long to build each of them—we had to manage the building along with our regular duties.

All the boats are excellent woodworking projects for the whole family to get involved with. And of course, the finished project can be enjoyed season after season by young and old alike.

New Tools from Old

Dick Dorn has come through again with a new and useful "Project for the Shop." In the January, 1993 issue, Dick showed us how to make a twin spindle sanding attachment for the drill press from the remnants of a burned-out belt sander.

In this issue, he shows us how to make a full-sheet, inverted orbital pad sander—complete with built in dust col-

lection. This is an ideal addition for sanding those small pieces you used to hold in one hand while you tried to hold the sander upside down in the other. The article begins on page 70.

Welcome a Master Craftsman

In the last issue, we introduced a new level of woodworking project, the *Master Craftsman Project*. In this issue we'd like to introduce a master craftsman, R. J. De Cristoforo.

By the early 1960s, Cris had already established himself as an expert in the woodshop and wrote about it in magazines such as *Popular Science* (no relation). He is the author of thousands of articles and volumes of woodworking how-to books including: *The Complete Book of Stationary Power Tool Techniques*, *The Complete Book of Portable Power Tool Techniques*, *The Complete Book of Wood Joinery*, *Woodworking for Beginners* and most recently, *R. J. De Cristoforo's Best Jigs, Fixtures and Shop Accessories*.

Cris has agreed to become a regular Contributing Editor to *Popular Woodworking* and you'll find his first column, "Cris Cuts," on page 16. You can also expect to see tool reviews by Cris in upcoming editions of "Tool Talk."

Of course, our *Master Craftsman Project* continues. In this issue, Assistant Editor Mike Cain built Ken Sadler's beautifully simple coffee table. Take a close look at the results of book matching an old alder board for the top. I don't think I mentioned it in the last issue, but I want to acknowledge Assistant Editor Matt Bear for the beautiful job he did on the contemporary desk project that appeared on the cover.

Rob

Safety Note

Safety is your responsibility. The manufacturers place safety devices on their equipment for a reason. In most of the photos you see in *PW*, these have been removed to provide clarity. In some cases we'll use an awkward body position so you can better see what's being demonstrated. Please don't copy us. Think about each procedure you're going to perform beforehand. Think ahead.

Letters

We welcome your comments, pro or con, about articles we publish. We also want to see color pictures of what you're building. Send your letters and photos to: Editor, *Popular Woodworking*, 1041 Shary Circle, Concord, CA 94518. Letters may be edited for publication.

The Old Mill Pond

Howard French's "Old Mill Wheel" from issue #68 (September 1992), inspired me to send you a photograph of my version.

The wheel is fully functional and is driven by the water recirculation system for the fish pond, enhancing the aeration. Planning the wheel and pond took five years, construction took about nine months.

Although not without initial problems, the wheel now runs 24 hours a day and is maintenance free.

Normally, I stick to projects like "The Heirloom Rocking Horse" shown in issue #75 (November 1993). However, to keep the landscaping of my back yard affordable, I had to undertake a project I normally wouldn't do.

Feel free to publish my name and address.

Dennis Brose
1841 Richert
Clovis, CA 93611

Ideal Shop Humidity

I am planning on building my "dream" workshop this summer and would like some views on what the ideal temperature and humidity should be in the shop. I'm not a firm believer in kiln-drying and will use racks in the shop to store my home sawn wood.

Mark Johnson
Osage, IA

See *The Workshop Book* by Scott Landis; ©1991; Taunton Press, Newtown, CT.—Ed

Nautical Dreams

I'm a waterman and live on Tangier Island in the Chesapeake Bay. My friend, Irene, wanted a bed for her son's room that would complement the nautical setting.

With her ideas, I designed and built a standard, double bed using the "Ship's Wheel" from your magazine (May 1991). I used pine for the project and it took two weeks to complete.

William Parks
Tangier, Virginia



Natural Mailbox

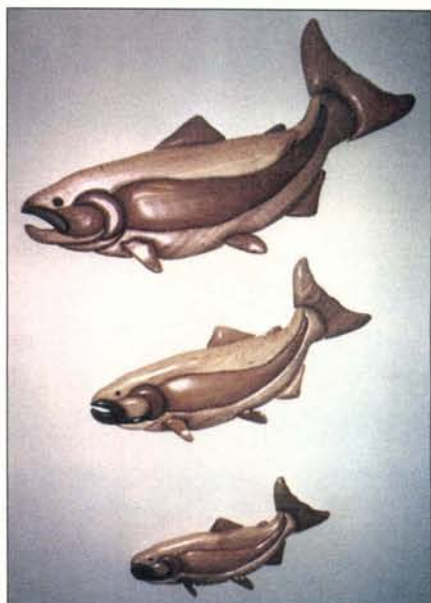
I recently completed the "Country Mailbox" project from issue #56 (September 1990). This really made a showpiece to put out for everyone to enjoy. I made some small changes to the plans, most noticeably being the wood shake shingles, a little stain and a polyurethane finish rather than paint. I really enjoyed this project.

Kenneth Day
Lebanon, Ohio

Small Fry to Big Salmon

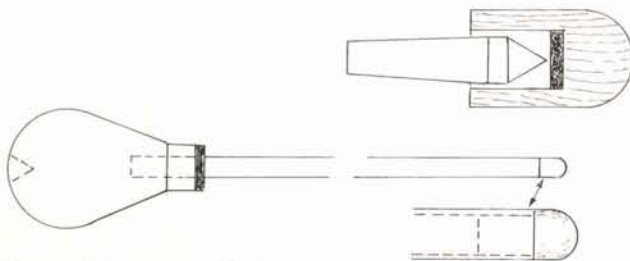
Thought I'd show you what I did with the salmon pattern (May 1993) in issue #72. I made several plaques using the full size pattern, then I reduced it 50% for the middle fish and reduced it again for the third size. I used various kinds of wood and finished them with polyurethane to bring out the natural colors.

Glen Kerchefske
Sheboygan, Wisconsin



Tricks of the Trade

Tricks of the Trade shares readers tips for making woodworking tasks easier and safer. Send your original, unpublished ideas to Tricks of the Trade, % Popular Woodworking, 1041 Shary Circle, Concord, CA 94518. We pay \$35 for each TOT we publish.



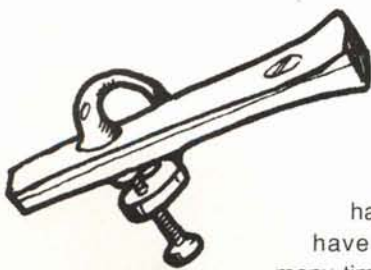
Super Bumper-Outer

If your lathe has hollow headstock and tailstock spindles, you probably reach for any metal rod or even a piece of dowel rod when you want to knock out the center. This is not very efficient and a rough end on the steel rod could damage the bore.

Why not make a special bumper-outer to add to your tool collection? It is an interesting turning project. Use a piece of brass or aluminum tube that slides easily in both spindle bores and about 3" longer than the distance through. Turn a wood plug to seal one end and cushion the blow against the center. Make a hardwood knob handle to comfortably fit the palm of your hand, preferably with a metal tube ferrule and drill it to take the tube. You can add a leather or rubber washer against the ferrule to protect the end of the spindle if you bump out too hard.

You have to catch the center as it is knocked out. You could turn a small block to fit your hand, with a hole to go over the center, so you can hold it when it comes free. A pad of rubber or leather at the bottom of the hole will protect the center point.

Percy W. Blandford
Stratford-Upon-Avon, England



C-Clamps from Old Jewelry

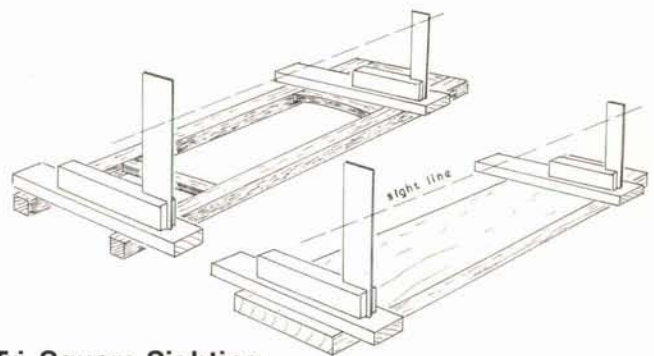
I have found that old, discarded earrings of the screw type make handy clamps for fine work. I have used these small clamps many times for fine soldering on jewelry and other small work. They are great for clamping small model pieces. I picked up several of these for next to nothing at a local garage sale.

Howard E. Moody
Upper Jay, New York

Wax Prevents Splitting

I experienced problems when installing stiles on some cabinets that I was building. The stiles kept splitting unless I took the time to predrill every nail. I found that by lubricating the nail with some wax, from an old wax toilet ring, the nail slid through the stile without cracking. To keep a little of the wax available at all times, I drilled a 1/2" hole in the end of my wooden handled hammer. In the hole I melted some of the wax. Now all I have to do is stick the nail in the end of my hammer, coat it with a little wax, and everything goes together without splitting.

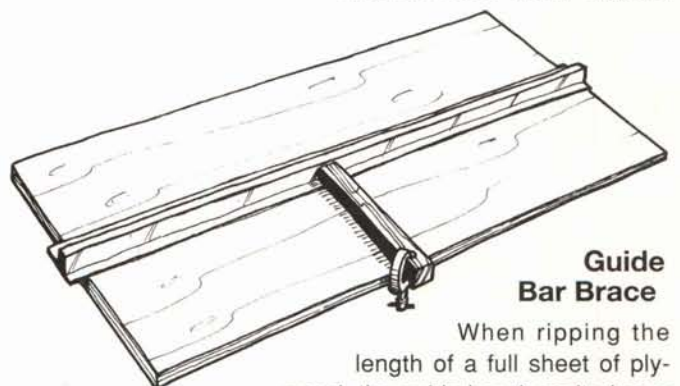
Mick Bannister
North Manchester, Indiana



Tri-Square Sighting

We all know it's possible to assemble a frame squarely or have a board flat in both directions, yet there's a twist in the wood. A simple way of testing for this twist, or winding, is to use battens across the ends and stand try squares on them. The tri-squares don't need to be the same size. If you sight along the blades and they are parallel, the job is true. If they are not parallel then you will need to make adjustments.

Percy W. Blandford
Stratford-Upon-Avon, England



Guide Bar Brace

When ripping the length of a full sheet of plywood, the guide bar doesn't always stay straight. It can bow away from the line as you push your circular saw along. To prevent this, I butt a scrap board against the guide and clamp it in place.

George W. Earley
Mount Hood, Oregon

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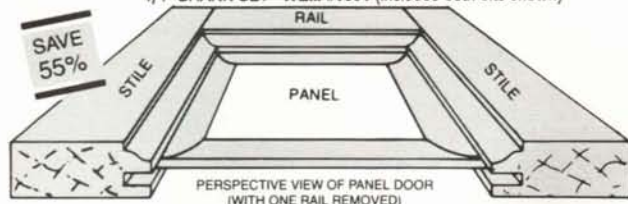
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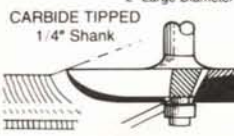
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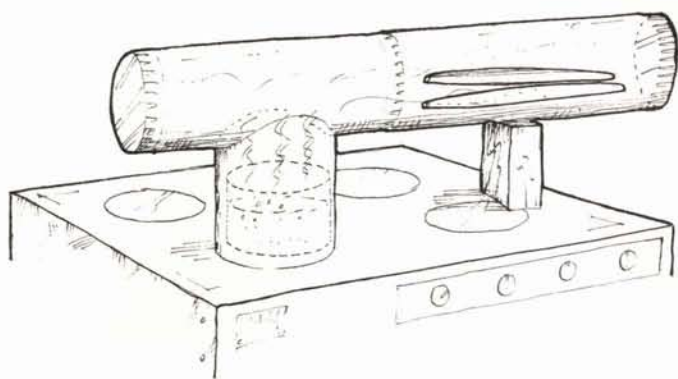


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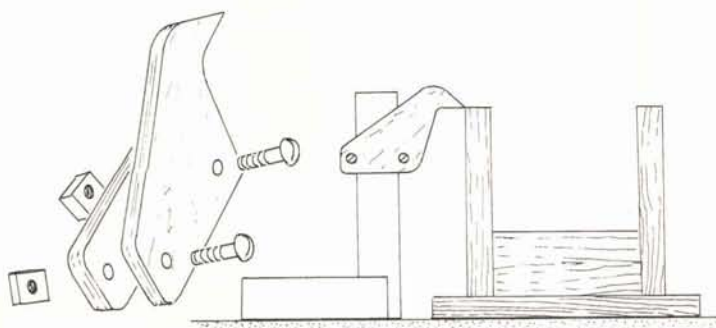
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Bending Spindles

I was repairing a Boston Rocker which needed two spindles to match the others. After I made the spindle blanks, I had to figure out a homemade device to bend them. I found some old furnace piping laying around. I put the pipe over a pan of water on my stove, put the spindles inside the pipe and plugged the ends. I let the water in the pan boil for an hour, creating a lot of steam. I took them out and put them in my homemade bending jig. They turned out perfect.

Tom Halsey
Charlotte, Michigan



Tri-Square Height Gauge

Occasionally I need to compare heights accurately. One example is checking leg lengths of a stool or small table, which can be inverted on the bench so the lengths can be compared to see which need trimming for the piece to stand level.

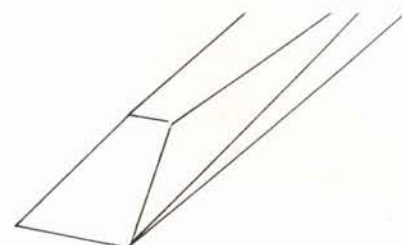
I've made a height gauge using a tri-square and some scraps of plywood. Leg lengths can be up to 15", so with a 12" square you have to extend the gauge. Cut it to a suitable shape and allow for the height you expect to need and have a point where you can mark with a pencil. Make a piece to go behind the blade and drill both parts for small bolts to go through close to the edge of the blade.

Percy W. Blandford
Stratford-Upon-Avon, England

Repairing Band Saw Blades

If you repair your own band saw blades, try cutting the ends at a 45° angle before you rejoin them. You'll find they last much longer.

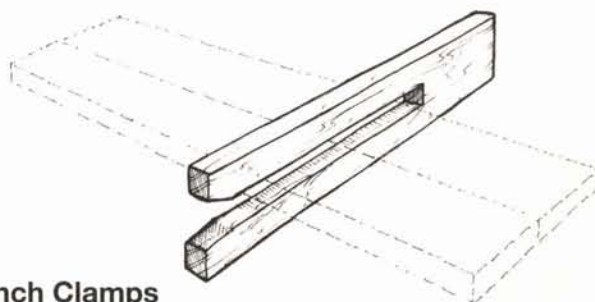
David F. Black, JR
Barnwell, South Carolina



Adapted Chisel

Bevel edge chisels are intended for paring inside angles of less than 90°, such as corners of dovetails. However, they can be up to 1/16" thick at the edge, so they will not go closely into the acute angle. It's better to adapt a 1/4" square edge chisel by grinding its edges to nearly no thickness at the end. It will go right into the acute angle, when needed, and is still suited for other cuts.

Percy W. Blandford
Stratford-Upon-Avon, England

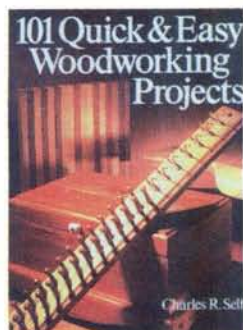


Pinch Clamps

I prefer to join boards edge-to-edge because of its simplicity and superior strength. The problem with not using splines, dowels or biscuits is that it's difficult to keep boards even so that a flat surface results. I recently solved this problem by making pinch clamps out of 1 X 2 scrap. Cut out an opening on the table saw or band saw. Make it a little narrower than the thickness of the boards you'll be joining. I have several of these handy when I am edge gluing. When I have applied the glue to the boards and placed them together, I press the clamps over the end of the joint to ensure that the boards stay aligned during clamping. Chamfer the ends of the clamps to ease their application. The pinch clamps will work if the boards are of different thickness. I slip the clamps off before the glue dries, or use wax paper, so they don't become permanently fastened to the boards I'm gluing.

Roopinder Tara
Willow Grove, Pennsylvania

101 Quick & Easy Woodworking Projects by Charles R. Self; Sterling Publishing Co. Inc., 387 Park Avenue South, New York, NY 10016; 160 pages, paperback, \$12.95.



Here's a volume that suggests projects that can be done well by someone who is a less than an expert woodworker. The volume includes tools and accessories, outdoor projects, plywood projects, kids' projects and a variety of others that are categorized by time rather than by subject. Many of these are super-quick projects, like napkin holders, candlesticks, mug racks, stools, frames, trays, tie and belt bars, planters and the like. This volume will be useful to beginners and to experienced woodworkers who want gift projects that can be made quickly.

Quick Guide Floors and **Quick Guide Decks** by the Editors of Creative Homeowner Press; 24 Park Way, P.O. Box 38, Upper Saddle River, NJ 07458; 80 pages each, paperback, \$6.95.

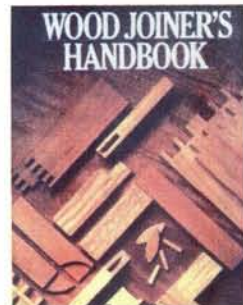


These are two in a new series of six books that bring home repair and remodeling to a new level of ease. Each volume contains hundreds of line drawings that illustrate the clearly written text.

Floors discusses the installation of hardwood flooring, parquet tile, resilient tile, ceramic tile, masonry, resilient sheet and carpet.

Decks begins with a design checklist and suggestions for developing a site plan. After a discussion of the basics, eight more chapters cover just about everything you need to know to build a deck and maintain it. These are good reference materials.

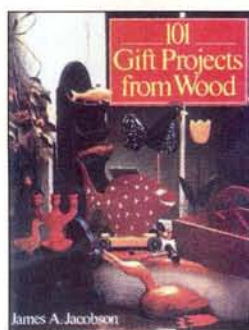
Wood Joiner's Handbook by Sam Allen; Sterling Publishing Co. Inc., 387 Park Avenue South, New York, NY 10016; 256 pages, paperback, \$14.95.



This is an excellent encyclopedia of wood joints. It describes their different applications and how to construct them. By studying the various joints and the rationale behind them, you are sure to learn at least a couple of new joints that will strengthen your next projects and it will open your eyes to new ways of designing and assembling them.

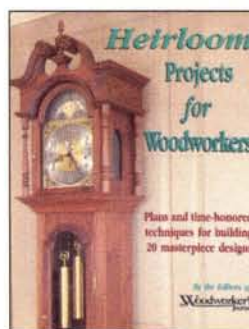
Hugh Foster is an English-teaching woodworker and author from Manitowoc, Wisconsin, and frequently contributes to Popular Woodworking.

101 Gift Projects From Wood by James A. Jacobson; Sterling Publishing Co., 387 Park Avenue South, New York, NY 10016; 160 pages, paperback, \$12.95.



This volume begins with rudimentary woodworking techniques, including tool and material collection. An index lists the 101 projects alphabetically for easy location. The text is very clearly written and nearly 250 illustrations help make the construction easy. The projects range from a simple stool, through some fairly elaborate turnings. There are sure to be several projects here that will interest you in the shop.

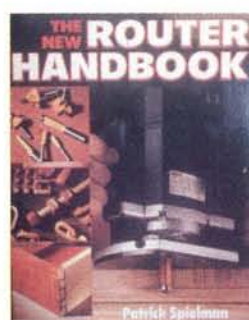
Heirloom Project for Woodworkers by the Editors of *The Woodworker's Journal*; Madrigal Publishing Company, PO Box 1629, 517 Litchfield Road, New Milford, CT 06776; 136 pages, paperback, \$18.95.



The subtitle promises, "...plans and time-honored techniques for building 20 masterpiece designs," and the book delivers just that. Most of these instructional projects are for the serious craftsman. The projects facilitate more intricate and involved features than the usual; such as tambour doors, tripod legs and the drop leaf rule joint.

The technical explanation of these projects can help to make a good woodworker even better. I believe you'll enjoy building the challenging projects contained in this elaborate text.

The New Router Handbook by Patrick Spielman; Sterling Publishing Company, 387 Park Avenue South, New York, NY 10016; 384 pages, paperback, \$16.96.



The Router Handbook was deservedly one of the best selling woodworking books in history and has now been completely reworked, revised and brought up to date. It contains over 160 pages more than its predecessor, there are over 1000 new and close-up photos and detail drawings. The book describes scores of routers, bits, accessories and various woodworking secrets. If you could be satisfied with just a single book on routers, this is the one I recommend. This book has replaced the original in my shop. **PW**

Finishing Forum

The Finishing Forum is an ongoing discussion about the art of wood finishing. If you have a question or a problem to solve, we'd like to help. If you have a tip or secret to share, or you recently tried a new product, write to: The Finishing Forum c/o PW, 1041 Shary Circle, Concord, CA 94518. Letters may be edited.

Milk Problems

I'm having difficulty surfacing my swinging porch bench. If I paint it white and then apply coats of polyurethane to seal it, it turns yellow. I get similar results using clear gloss and semi-gloss. Why is this happening and what can I do to remedy this problem?

Leo V. Waters
Bellevue, Nebraska

Practically any varnish product that you use will have a slight amber tone to it, and this is particularly true of some polyurethanes. Even though they may look clear in the can, applying them over white paint usually, in time, reveals a yellowish tone where the brush-strokes overlap, or where runs or sags may be a problem. In time the entire surface may yellow.

If you must apply polyurethane over your paint, my advice would be to purchase the highest quality poly you can get and hope the problem is eliminated. I've had good luck with Pittsburg Paints REZ Polyurethane and I'm sure there are other good polyurethanes on the market. (The cheaper ones will yellow the quickest and the most). You might also try a marine varnish, which is light resistant and might give you good results. (Inquire at a shop that makes or repairs boats).

In passing, remember that any time you top-coat paint (especially white paint) with varnish, it's going to change the tone somewhat and there's not much you can do. The only finish I

Dick Fitch is the resident alchemist at the Bartley Collection, Ltd.

Tom Wisshack makes and restores fine furniture in Galesburg, Illinois.

know of that's really clear (at least initially) is lacquer, and that's not very practical outdoors.

Tom Wisshack

Oily Hardwoods

Do you know of any finish that contains UV inhibitors and/or an anti-oxidant that can be used with oily woods such as cocobolo and bocote? All the products that I have tried do not seem to dry.

Steven Waterbury
Chale Vista, California

I have not worked specifically with cocobolo and bocote. I have done work with teak and to some extent with rose woods, both of which may be considered oily woods. I can only presume to extrapolate experience with these to problems inherent in finishing the woods you are using. Finishing "oily" wood varieties presents two potential problems—poor adhesion and inhibited drying.

You specify the use of UV absorbers and/or an anti-oxidant in the finish, so I assume the wood is exposed to sunlight or another energy source likely to deteriorate the transparent film.

Conventional drying oils, oleoresinous varnishes, oil modified resins, etc. cure by auto oxidative polymerization and will exhibit impaired drying in the presence of an anti-oxidant. Their ability to dry efficiently does not appear to be affected by normal levels of absorbers.

Generally, high molecular weight film formers that require initial stabilization against oxidation (ethyl cellulose, vinyl chloride, etc.) and many others that do not require stabilization, dry with such great cohesive strength that they exhibit poor specific adhesion and are not prone to tolerate much, if any contamination. They may, however, be more tolerant of plasticizing effects.

I think it is safe to assume that the drying problems you are experiencing are the result of solvents in the applied finish dissolving the surface oils in the wood, drawing them into the film where they stay after the solvents evaporate. Since the oils are essentially nonvolatile, their plasticizing

effect is long term.

We are faced with the dilemma of one type of finish that may dry but may not stick and the other that may stick but not dry.

I think the best approach is to go with the more conventional material and concentrate on cleaning the surface, assuming of course that your application does not require the use of a, so called, high performance finish.

In either case, start by wetting the wood with water to open the grain and allow it to dry. While the grain is open, wash it with mineral spirits. Use a brush that will scrub, but not scratch the surface. Follow this cleaning procedure with flushing and rinsing with solvent. Allow to dry.

At this point there is a good chance that a tolerant finish will adhere well to the surface. As a precaution against oil migration or residual contamination, you may take advantage of an incompatible solvent system and use clear shellac or an alcohol soluble phenolic/vinyl product usually supplied as knot sealer, as a sealer. Use either at a viscosity that will penetrate. Thin either material two or three parts denatured ethyl alcohol to one part resin solution (shellac is usually sold at 3 lb. cut, the phenolic at 25% solids). When dry, the sealed surface should be sanded to improve the coarse texture of raised grain, and abraid the surface in order not to greatly reduce the mechanical adhesion.

Dick Fitch

Kids' stuff

What type of non-toxic finish would you recommend I use on children's wooden toys? Any information you can give will be greatly appreciated.

Orry Sheridan
Milford, New Jersey

To finish your wooden toys safely I suggest Behlen's Bowl Finish, available from the Wood Finishing Supply Catalog, 1108 North Wyoming Road, Casper, Wyoming 82601.

Tom Wisshack

Product Review—General Finishes High Performance Polyurethane

General Finishes High Performance Polyurethane varnish is a water based, environmentally friendly product. In general, I'm skeptical of water based products because so far I have not been too happy with the results I've gotten with them. But I keep trying because I'm convinced that companies that make water based finishing products will eventually come up with products that rival the old solvent based varnishes and lacquers. General Finishes polyurethane comes very close.

I experimented with this product on small to medium-sized projects because, as I suspected, it dries very fast and is difficult to apply evenly to larger surfaces. This is one of the trade-offs of a water based finishing system; though I found it ideal for

small boxes, along with a series of inlaid jewelry I've been working on. The fact that there is virtually no odor during application and inbetween sanding, makes it very appealing.

Other advantages include floor wear durability, water clean-up and anti-yellowing properties. I recommend raising the grain of your wood surface prior to using this or any other water-based varnish, because some grain raising will invariably occur when applying the varnish. After the wood dries out, sand it to perfection and it will not be much of a problem. Any slight roughness can be sanded out with worn 400-grit wet or dry sand paper, and subsequent coats will not raise the grain.

I found this product to be ideal for my jewelry because it dried so quick

and reliably that I could apply four to six coats in a day and rub them out to perfection. Needless to say, this would not be possible with a traditional varnish. Also, because this varnish does not use a volatile solvent, it is friendlier when it comes into contact with exotic woods like purple heart and ebony; it is absolutely clear and UV stabilized.

I was delighted with the results I got with General Finishes High Performance Polyurethane. If the company adds a retardant to this product so the applicator time could be extended, I'd completely switch over from solvent based urethanes to their water based equivalents.

Tom Wisshack

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Human Factors in Project Design

Is there an editor, how-to writer or designer who hasn't at some time received a note from an unhappy woodworker whose temper became short because the project component he cut to size was also short? The answer, unfortunately, is NO! Anyone who doubts this need only glance at the "Readers' Letters" or the editor's apologies in any how-to magazine.

"It's the typesetters fault," say the originators. "We said 21/2", they printed 21/4". Or, "It's the shrinkage that occurs (slight, but there) when full-size plans are printed that's at fault!"

Passing the buck—it is a multi-directional street—doesn't save the material or placate the builder. However, lest we become too complacent and righteous, even when we design from scratch and compile our own materials list from our own sketches, we can unwittingly deprive a part of some of its true dimensions, or overlook the essential association between ourselves and overall project size and shape. Human error!

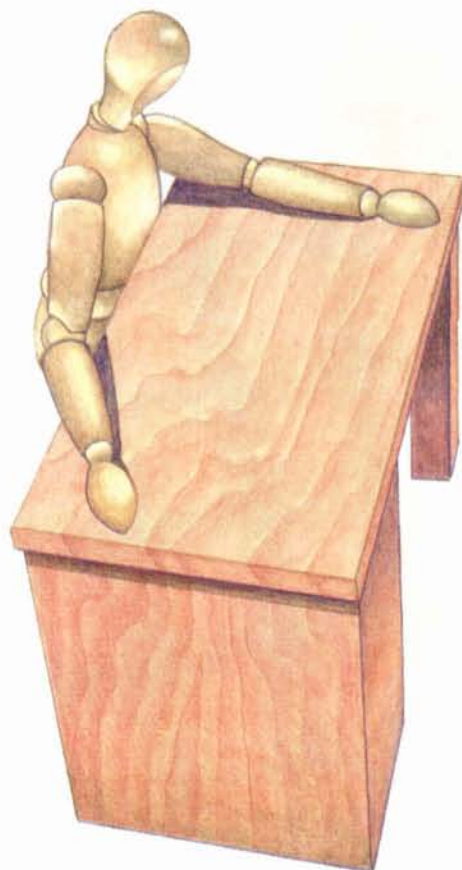
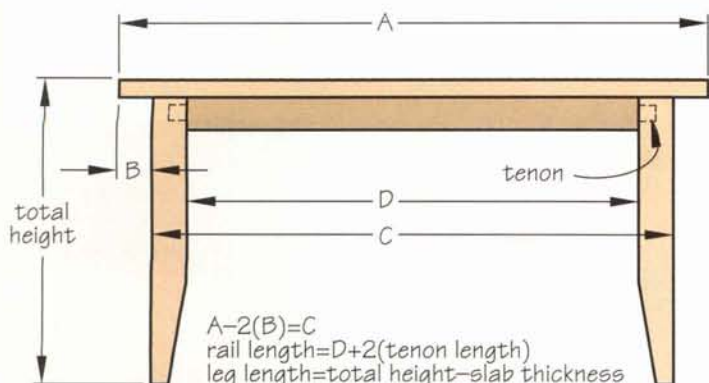
What to do? After many years of woodworking, I've established a particular approach to project building, whether it's an original design or one that I'm copying from the pages of a magazine or book. My system is influenced by several factors.

One—don't accept the dimensions on a materials list or a drawing, yours or another's, as bible.

Two—most projects have a main component that should be viewed as the basis for accurately determining, or checking the sizes of other parts before sawing.

Three—design, as always, follows function.

This is the first in a regular series of articles that we look forward to presenting by noted woodworking author R.J. De Cristoforo.



The first two thoughts are closely related, as are the second and the third. It's chancy to cut parts to the dimensions shown in a materials list, or have them cut for you at a lumber yard without first verifying accuracy—the main component being the place to start.

Consider a coffee table. The major part is the top slab and the critical dimension is the height of the project. If the table is 17" high and the length of the legs is called out as 17", you know that someone has not allowed for the thickness of the slab. This is a minor error since shortening, as opposed to lengthening, solves this particular problem.

If the project has rails and the connection between them and the legs is a mortise and tenon joint, then the length of the rail must be the distance between the legs plus the length of the two tenons. Another fact to consider is the overhang of the slab since it affects total span of the leg and rail assembly. All of this, of course, should be considered by the designer, typesetter, and others, and certainly is—but watch out for human error!

If you are building the table, begin by cutting only the slab and marking on its underside—carefully—the amount of overhang. Now you have a means to accurately determine the position and size of the other components. Call this “cutting as you go” or “checking on assembly.” Whatever, it’s a more foolproof way to build than neglecting to examine specifications that might have errors.

Let’s consider full-size plans and the shrinkage we mentioned. The factor doesn’t much matter if the plan is a silhouette of an animal for the garden or an ornament of some sort, but it’s something to consider if the part has a length and width that must conform with mating components. And, if the component has a hole or a joint form like a dado or rabbet whose placement is critical, you want to be sure the location hasn’t moved.

On Your Own

Design is often thought of as the appearance of a project. It should be viewed as the engineering that influences the utility aspects of the construction. A table may have a nice appearance, but if it doesn’t follow the norm for height it won’t be comfortable for dining.

Regardless of whether the table is square, round, rectangular, whatever, it must provide elbow room for the number of people it’s supposed to accommodate. There is a little room for being arbitrary here, but if you go plus-or-minus too far, your project will lack practicality it should have to be successful.

Basic table spacing allows about 16" per place with 8" in between. A rectangular table for eight diners would therefore measure 36" X 82". The minimum diameter for a round table for four people is 36"; 48" for six.

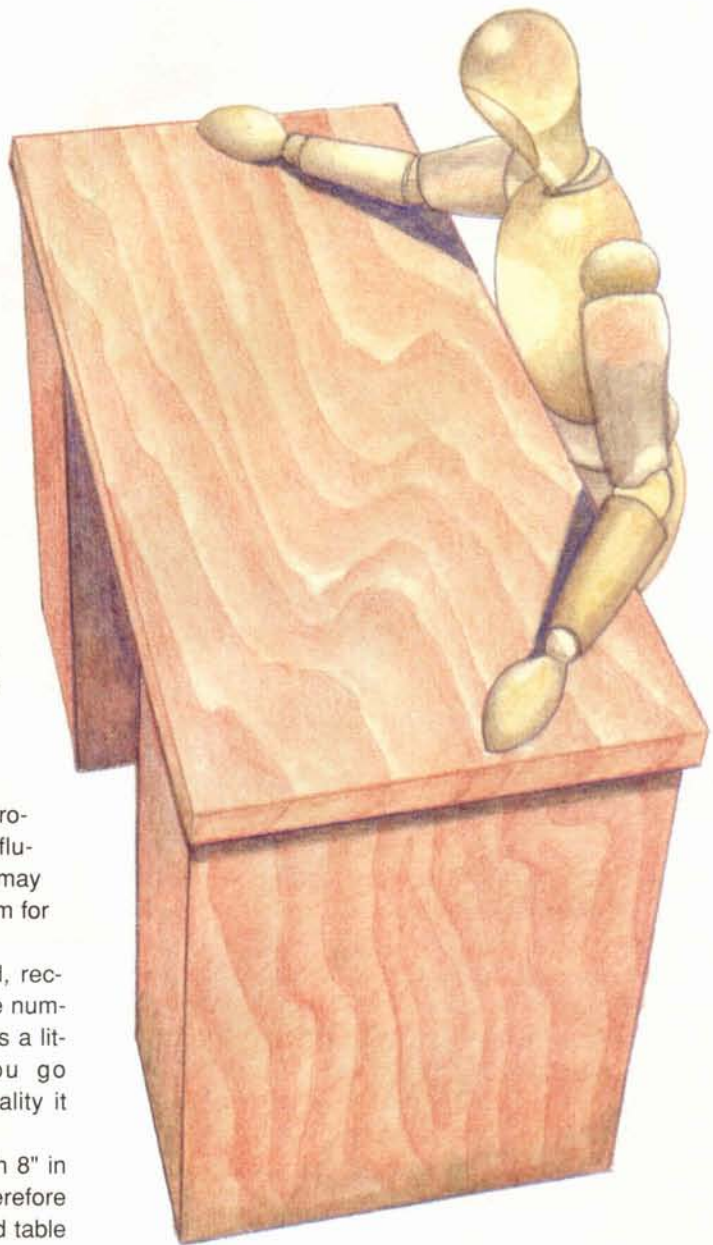
With these dimensions in mind, you have the main part from which you can establish the placement and the dimensions of the components that comprise the substructure.

An example of how the anatomy should influence project design or engineering, is a desk. When you have no specifications, you can quickly establish them for the main part—the top.

First, while sitting, reach forward with one arm and measure from your chest to your finger tips. This is the width of the top.

Second, stretch your arms to the left and right—the total span is the maximum length of the top.

The point is, that while sitting at the desk you should be able to reach anywhere on the surface. For a smaller desk where



you would sit toward one end, you can determine a practical length for the main part by reaching to the left or right with one arm and then adding the width of your body. Many projects, like a desk, can be seen as having two main components. In this case, the top and the sides of the pedestal.

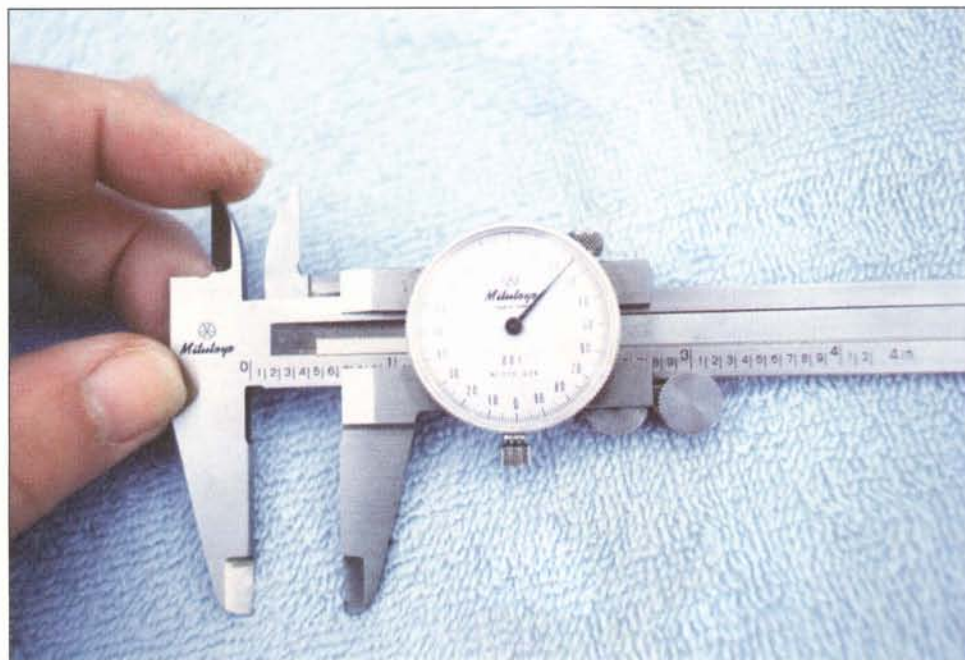
Appearance or style, whatever you wish to call it, follows functionality. Here, you preview the project as a whole and visualize adornments that can personalize your efforts. You can design a particular substructure, leave the edges of the top square or form them with a router, have a storage pedestal at one end and shaped legs at the other end.

Whatever your preferences, the basic thing to remember is “check twice before cutting!” **PW**

Mathematics

For The Woodworker

Part 2



by Robert Calvert

In the first part of this article we covered the basics of scientific calculators, the decimal system and how to convert and use fractions. In this part we'll discuss the best measuring devices, a good beam compass and some drafting and shop tips.

You may be wondering what measuring devices and beam compasses have to do with mathematics. The truth is, mathematics is an exacting science and the better the measurement you take, the more accurate the answer will be. By the same token, a good beam compass with properly sharpened lead, will lay out a very accurate circle. This is very useful when stepping off cord lengths for a variety of polygons—any figure with three or more straight sides. Of course, we call figures with a low number of sides by their names, i.e., triangle (3), square (4), pentagon (5) and so on, but for many sides the term polygon is most often used.

Bob Calvert is a retired tool designer and frequent contributor to *Popular Woodworking*.

Accurate Measurement

The most common measuring device is the machinist caliper. These are great for measuring round stock as well as inside diameters. They're manufactured in three versions, vernier, dial and digital and some are made of high impact plastic. They all function the same but the read out is different.

Due to limited space, we won't describe how to read a vernier scale. If you wish to pursue this older, less used method I recommend a book titled *Workshop Math* by Robert Scharff. This book has a very good section on how to read vernier scales beginning on page 221. Along the same lines, the micrometer is a bit of an over-kill when working with wood, but can come in handy for very accurate measurements of such things as drill bits and pins.

The dial caliper is easier to read than the vernier type. It allows measurements without reading glasses which for me is a real time saver. In the photo above is a caliper set at .625"

(5/8"). The bottom scale on the bar is reading slightly past 6 with the graduation line exposed. This means the instrument is reading something more than .6". For the rest of the dimension we look at the dial. One full revolution of this dial is equal to .2" or 2 marks on the bottom scale. The dial has two 0s on it, one at the top and one at the bottom. The distance between each zero represents .1" or slightly more than 3/32".

Since my dial is set at 25 past the top zero, you would add 25 to the basic .6 get a reading of .625" or 5/8" expressed as a fraction. There is one drawback with a dial read out in a wood shop. The dial is driven by a tiny gear on a rack and often, sanding dust can build up in the rack's teeth and cause the caliper to read in error.

To eliminate this, always zero the caliper before use. Wipe the anvils between the jaws and close them totally. If it reads anything other than zero it has jumped a tooth or two. To reset the

pointer, loosen the dial and rotate it to zero in the closed position.

Dial calipers can be purchased for as low as \$10 for the plastic models or in stainless steel for \$25 and up.

The next step up is the more recent electronic digital unit. These have become nearly commonplace and can be purchased for under \$50. Reading error is virtually eliminated because the dimension is displayed directly. The numbers are large, making reading even easier than the dial. Additionally, they are said to be unaffected by sawdust since there is no rack and pinion. I can not testify to this since I do not own one, but I am thinking about buying a unit.

Circles

Having a good beam compass is much like having a decent wrench. Of course, you can draw a large circle with little more than a pencil and string, but, for accuracy, the beam compass is your best bet. After working in the engineering field for over 40 years, I've had the opportunity to try virtually all brands. The one made by Feranco since the early 1950's, is by far the best unit around.

The photo below shows my beam compass (less the leads) which comes as a set. The bars are extruded, anodized aluminum. The notches hold the beam ridged when it's assembled for larger radii. The two coursers slide onto the bar smoothly and lock tightly in place. This is very important for large circles on a rough wood surface. I

remember once borrowing an expensive German beam compass that held the coursers in place with only leaf springs. I wasted a lot of time that day because the courser slipped and drew a bad arc on my layout.

Pricing information has been received from Feranco in time for this writing and has remained unchanged since July of 1991. The basic set as shown with nylon coursers (#302) is \$39.95. The set is also available with plastic coursers (#202) for \$33.95 and with aluminum coursers (#402) for \$46.95. Additionally, many accessories are available, such as long, one piece beams, circle cutting attachments, marker adapters and so forth. Sales brochure, price and accessory list are available from S.S. Specialties Co., 10838 Lakehurst Court, Cincinnati, OH 45242. Tel. 513 489-4505.

Drafting leads are available at all drafting supply houses and come in many grades of hardness. I use 3-H for nearly all work, paper or wood. The softer the lead the darker the line, but it will wear down faster. The number is the hardness—4H is much harder than 2H. There is a correct way to sharpen the lead for compass use. This is best done with a sanding stick or emery board. The lead needs to be a chisel point starting from the inside between the coursers, and the angled flat needs to be perpendicular to the beam. This is done so that the circle's outside edge remains true in size and doesn't change as the lead wears.

A Few Shop Tips

I've read so many various ways of dividing a circle into six equal parts that it's become comical. I've seen everything from using a hex nut to complicated calculations. The cord length for any six sided figure is equal to the radius.

Use a compass and draw your circle (makes no difference what size) and without changing the setting, step off the circle using the compass as dividing points. To make it come out perfect, you need to set to compass point accurately on the very outer edge of the circle every time.

Another drafting trick is to equally divide two parallel lines into several divisions. Say you have a 4" wide board and you wish to divide it into three equal widths. To eliminate the division and then difficult measuring, lay your scale (ruler) on the board at an angle, so it reads 6" edge to edge. Then mark at 2" and 4" on the scale. This is ever so much easier than measuring at 1.333" for each section.

How about cutting off a square piece of 1 X 4 on a band saw without the aid of a miter gage. Just stand the piece up on edge and touch the running blade to form a shallow kerf. Then flop the piece back toward you lying it flat—follow the kerf. This method assumes your table is square with the blade. To cut a long piece into two equal parts on a band saw just angle the piece through the blade. This works best with sticks not wide boards.

Lastly, use the old 3-4-5 method to check for square. This method is mostly used on large things like foundation layout strings. To use, measure out 3' from the corner stake and mark the string. Then measure out 4' on the other string and mark it. The distance between the two marks measured diagonally will be 5' if the two strings are 90° to each other. Other dimensions work if they are the same ratio—6-8-10 or 9-12-15.

Next time, we'll learn to understand mathematical formulas and how to read them. And more importantly, how to enter the data into your calculator and get the correct answer. **PW**



Shaping A Future



At age 35, Dan Kvitka has already earned an international reputation for turning beautiful vessels from exotic woods—vessels set apart by their unique, yet classic lines. The foundation of his work is his innate artistic sense and a feel for what a piece should look like. This direction came by his training as an industrial designer. In addition, he's developed a method of hollow-blind turning and has designed the special tools to accomplish this.

All this comes naturally because, as he says, "I grew up in a woodworking shop. We always had a studio, my father was a woodworker and hobbyist—a very capable man. We always worked with him doing furniture projects, sailboats and cabinetry. We always had projects going in the shop. We had interesting tools and space allocated to creative interests. My brother and I were allowed to use the lathe when we were seven or eight years old."

The skills he learned and the knowledge he acquired from working so closely with his father have been important to his success. More important is his attitude—a state of mind that he's capa-

ble of doing whatever he sets out to do—which was fostered by his father.

He was born and raised in Southern California, near the epicenter of last January's earthquake. He spent his teen years in Northridge. He went to Cal State Northridge then on to the Art Center College of Design where he graduated with a BS in Industrial Design. This got him a job as an industrial designer with Hewlett Packard in Corvallis, Oregon. On this point, I think you'll find the story more interesting if he tells it.

What kind of work did you do for Hewlett Packard?

I designed calculators and hand-held computers. I designed how they looked, how the keys felt when you touched them, what the graphics looked like in the displays and how they felt in your hand. I acquired a great background in materials and processes. While working as an industrial designer, I realized that in industry you don't get to be as creative as I really wanted to be. I figured about ten percent of my time I was actually designing and being creative. The rest was more the corporate kinds of things I was not interested in at all. So I began making furniture at home in my spare time. I very quickly became interested in turning because it was something I could do in an evening and feel like I'd done something really creative.

How many years did you work for HP?

I worked as an industrial designer for five years. For four

If you have any questions on the subject discussed in this article you may direct them to Ken Sadler, 75 NW 90th Ave., Portland, OR 97229. Mr. Sadler would also be happy to advise you on any other business related problems.

of those years I was also doing my wood turning. After two years I started doing craft fairs on my holidays. I worked nights and weekends and used the fact that I was an industrial designer to help get my business started.

When did you begin to concentrate strictly on wood turning?

In 1982 I began to focus 100% on wood turning. I was still at Hewlett Packard, but did my wood turning as a second full time job.

So you started your own business while still working for Hewlett Packard?

That's correct.

What made you think you could make a living doing this?

It wasn't my original intention. I wanted to turn things and enjoy myself. As my work got better, I needed to do something with it. I also found I needed tools and equipment for the work I was doing, so I started selling the work in order to buy those things. I was still working for the company so the money was not my first priority. I quickly realized it was something I'd really prefer to do. I started developing my business by contacting galleries. I got my work in some galleries, got photographs published in magazines, really did all the background work necessary to get the business started without taking any profit from it.

When did you decide that you could make enough money to do it full time?

I left HP in 1985 and I've been on my own ever since.

Did you make an acceptable living that first year?

No, absolutely not. I had saved vigorously while I was at HP and had some money to live on. It probably took two to three years before I was making a decent living. I was making money, but it was significantly less than I had been as a designer. I still make significantly less than I would have if I'd continued as a designer.

That's not an unusual situation, but what you're substituting, I suspect, is a situation where you're doing what you want to do and that's more important?

Absolutely.

What was your design philosophy?

Being an industrial designer and coming out of a good design school having all of the big names in industrial design, I like a clean, modern, almost classic style. Form was something I was very interested in. But it took a while for me to develop my own style. I think it's very natural

as an artist that you emulate what you see out there and your own style slowly builds. I think in the beginning I thought I was doing my own style, but looking back I realize that I was very influenced by other artists. It took seven or so years to

establish a strong style of my own. I think at this point my work is very recognizable. If you've seen two or three of my pieces, you could see a very different piece in a totally different setting and realize that I'd made it.

Where do you get your wood?

I have importers all over the country that bring me woods from all over the world. Fortunately, one of my best importers is right here in Portland. Every couple of weeks I would come to Portland to see what had come in. Now that I've moved here, I'm buying quite a bit more wood because he's so close. I've got other good dealers too, mostly on the west coast.

Apparently you spend quite a bit of time looking for the right kind of wood?

Well, I think, as most woodworkers, that I'm a wood nut. I always want to see the most amazing piece of a given species of wood. I'm committed to turning the exotic woods and working with rare, beautiful woods. I look for the best in whatever type I'm using, so I'm always foraging around looking for great pieces.

What percent of the cost of what you make goes into the wood?

That varies a great deal. I've tried to come up with a formula that says if the wood costs a certain amount then the piece should cost this amount. The prices are somewhat market driven. Some of the woods I turn are ferociously expensive. There can be a huge difference. For example, the same small piece can have five or six dollars or up to a hundred dollars worth of wood in it. The price of the finished piece won't fluctuate that much, but there will be a difference. A rule of thumb should be that the retail price is ten times the cost of materials.

Then you don't apply the theory of pricing the piece at the highest price you think you can get at that time, regardless of how much time and wood costs are involved?

I don't know if that's true or not. I've never looked at it with that conflict in mind. I have a history of prices—a twelve to fourteen year history of a piece about this size is priced around this price. But then I'll turn a piece out of a very rare and expensive block of wood about that same



The Business End

size and I think is absolutely incredible. I'll raise the price a little bit. Relatively speaking, my prices have not gone up very much in the last five years. The market hasn't really allowed for that, so maybe it's true, I price it as high as the market will bear. It is important to me that people be able to afford my work. Some is very expensive, but I do have pieces that almost anyone can afford. I've also gotten faster through the years so that while my work is not more expensive, it's a little more profitable.

Do you have a backlog?

That always seems to be my problem, I'm not able to produce enough. If I was able to keep all my galleries stocked, I might be able to sell more, but I don't know if that would be true.

You never make anything on order?

Never is a big word, I do have people call and say, "I saw a piece of yours at a show and if you ever turn something like that I'd be very interested." I'll go back and try to make something similar and get back in touch with the client. Galleries do come to me at shows and say they'd like to buy ten pieces of a certain size in these kinds of wood. I do work that way, but it's a very small part of my business. My business is pretty much show to show. In a year, I'll do four to six of the major craft shows across the country. I produce work to take to the shows to sell. Whatever I have left over I use to restock my galleries. Then I'll start over and create a body of work to take to the next show.

How much did you invest in equipment at the start?

That's a tough question because it happened over such a long period of time. It was always one tool at a time. In the beginning, all my expendable income went into tools or wood. If I had a good show, I'd collect more tools. So how much did I spend? Thousands of dollars over the years, and it continues. They wear out and there are always new developments in tools. I'm not a real tool junkie, but I like to have the best tools. Lately, I've invested in safety equipment, having the right dust mask to keep my lungs healthy and the right air filters to clean the air in the studio.

Have you ever had anyone working for you?

I did, and it was a wonderful experience. In 1989 I taught a workshop in Utah where I met a man with whom I became good friends. He lived in Denver, and things turned out that he needed some work and I needed someone to help me out. He moved to Corvallis and worked for me a couple of days a week and then did his own work the rest of the week. We both really enjoyed that. He would help me on my smaller pieces, mounting work, doing the rough hollowing. In the

finished product, everything you saw was off of my hand, he just sped the process up for me.

Why did you break that up?

Economics, neither of us were able to make a living as the 90's went on. The economy turned sour and neither of us were able to sell enough work. My work from him had been about half of his income and I couldn't keep him that busy and he couldn't sell enough of his own work to take up the slack. So he had to go and get a job.

How do you ship your work to the buyers?

I ship everything UPS. I've worked out a packaging setup where I wrap the item in bubble wrap, surround it with plastic popcorn, and double box it. I've never had anything broken.

Where was your first shop?

In Corvallis, in my garage. Then I moved to a new home and had it in a bigger garage. Later, I built a large studio on the adjacent lot.

Why did you move to Portland?

I met the woman of my dreams. She's very grounded and connected in the Portland community. She's a school teacher and wouldn't have the opportunities in Corvallis that she has here. I can live and work anywhere, so I moved here to be with her.

What was your marketing process in the beginning?

That's interesting. I was recently asked by an up and coming artist how to get into galleries. My early experience with galleries was writing letters and sending slides, and getting letters back saying, "we don't need any new work and we don't look at slides." I was always turned down. Every time I walked into a gallery cold with a box full of work, they would sit me down in the office and give me a lecture about how totally inappropriate it was. They'd tell me that you don't just walk in, you make appointments and send slides—this is not the way you get into galleries. Then they would look at my work and put it in the gallery. So I learned that this is the most successful way to get into galleries. Apologize for coming in cold, listen to the lecture, then show your work. As soon as they saw the work and realized I would leave it with them, they changed their tune. That's how all of my early galleries got set up.

Where did you go from there with your marketing?

As my work got better, I also experimented with photography. I got good at photographing my work—good at presenting my work. I applied to every juried competition there was and I subscribed to all the trade magazines. I kept myself educated as to what was going on where. My next point of attack was the major craft fairs. I didn't want to do the smaller outdoor shows so I started applying to the national shows



and got in very early in my career. I was very lucky.

Were they consumer or trade shows?

I started out doing the American Craft shows. The majority of those shows have wholesale and retail days. Certain days are only open to the trade. Galleries, shops and the museums come through and look at the work, set up shows and buy wholesale. On the other days they're open to the public and I can sell directly.

Did you keep records of the names of the galleries and gift shops that stopped at your booth and did you contact them other than at the shows?

Absolutely. I found that any galleries I dealt with needed to be contacted at least every two months. Just to let them hear my voice. I'd ask them how the work was selling, answer questions, trade pieces (this one sold but this one didn't, so send more of the things that are successful), and just take care of the people that were representing me.

Was all your work placed on consignment or was it sold outright?

In the beginning I would beg, borrow, or steal to consign my work anywhere. As my work became better and I became more sought after, I changed my tune a little bit. New galleries I'd never dealt with had to purchase my work to get started or offer me a show—an advertised show where they'd print an announcement, put an ad in the American Craft Magazine—or somehow promote me for the opportunity to have my work on consignment. I found they sold my work much better when they bought it or invested something in me than if I just gave it to them to dress their shelves.

That's true regardless of what you're producing. If the place that's selling it has an investment in it, they'll sell it. If not, they don't care whether it moves. It sits there, it's decorative and it costs them nothing. The arts is the only business where shops get their work on consignment.

It's a very frustrating thing.

You're right, if the work looks beautiful and it draws people into the shop and they buy something else your work is fulfilling a purpose for the shop. If they have money invested in it they're much more apt to work harder to get their money back. I don't mean to portray them as not doing a good job, they do an incredible job, it's a very difficult business. But we all have to do our share, I work hard to ensure they have the materials to sell my work, that they're educated about the woods and the process. I keep in touch with them as questions come up so that they're better educated in selling my work. I find there's a lot of negotiating

necessary to promote the sale of my work. For example, I'll want to sell them certain pieces and if they buy them, I'll consign big pieces with them. So, if they buy the smaller pieces I'll consign larger pieces and that helps them sell the smaller ones. It works to the advantage of both of us. I see that as a good strategy. It's in their interest to sell the large pieces because they bring a larger dollar commission, while it is also in their interest to sell the small ones because they have their money invested in them.

What percentage do the galleries take?

Too Much. Almost all of my galleries take 50%, there are a few that take 45%. A lot of the galleries

give their best clients or collectors a 10% discount and force the artist to absorb half of it, so they're actually taking 55% of the retail price. When I sell to a gallery, it's 50% of the retail price which I set.

What's the cost of participating in a show?

An East coast show runs anywhere from \$2500 to \$3500. On the West Coast, if I drive, that cuts about \$1000 to \$1200 off that amount.

How many shows do you do a year?

A high of seven and a low of three. It depends on what I'm concentrating on in a given year. Sometimes I put more attention on gallery shows and do fewer craft fairs, then sometimes I do more craft fairs.

Are you able to sell enough at each show to more than pay the cost?

I have to. The shows are where I make the majority of my income.

What are your present gross annual sales?

It varies from year to year, but it's been between \$50,000 and \$75,000 in recent years

What's in a typical day for you?

I hit the studio about nine-thirty, work for three or so hours, take a lunch break and take care of any errands such as banking or shipments, things like that. Then I'm in the studio until about five thirty. In

the evenings I do the office work.

What is the most important thing in your life?

My family. My wife and home life and my immediate family are number one.

The thought to carry away from Dan Kvitka's story is simple. Create a business that excites and stimulates you and makes your work a joy instead of just a job, then the money you make takes second place. PW



Roughing Tools

Adzes, Axes, & Hatchets

The Adze: An Ancient Invention

In this day and age of efficient and relatively cheap machinery for the preparatory surfacing and sizing of wood, the tools that woodworkers once used to perform these functions are seldom seen and rarely used. But axes, adzes, and hatchets can still be useful, as I was reminded only the other day when a friend of mine who had recently taken up carving called to show me something he'd just 'invented'. "It's just the thing for removing a lot of wood quickly and yet still keeping control. Look at how I fixed this spare plane-iron to a piece of wood I picked up outside." He showed me a small oak branch that had grown out steeply from its parent trunk. "The acute angle allows you to fix the blade to one part and use the other as a handle. You can cut towards you and still see precisely what you're doing."

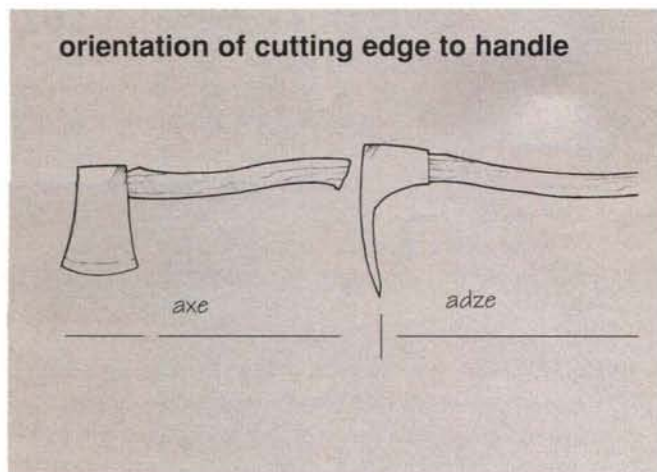
I was sorry to tell him he'd merely rediscovered one of the oldest tools known to mankind—the carving adze—but it was nice to reflect that modern technology had not yet rendered it completely obsolete. In various forms the adze has been around for several millennia. The ancient Egyptians regarded this tool so highly that the hieroglyph representing an adze translates literally as 'the able one'. Most people still think of

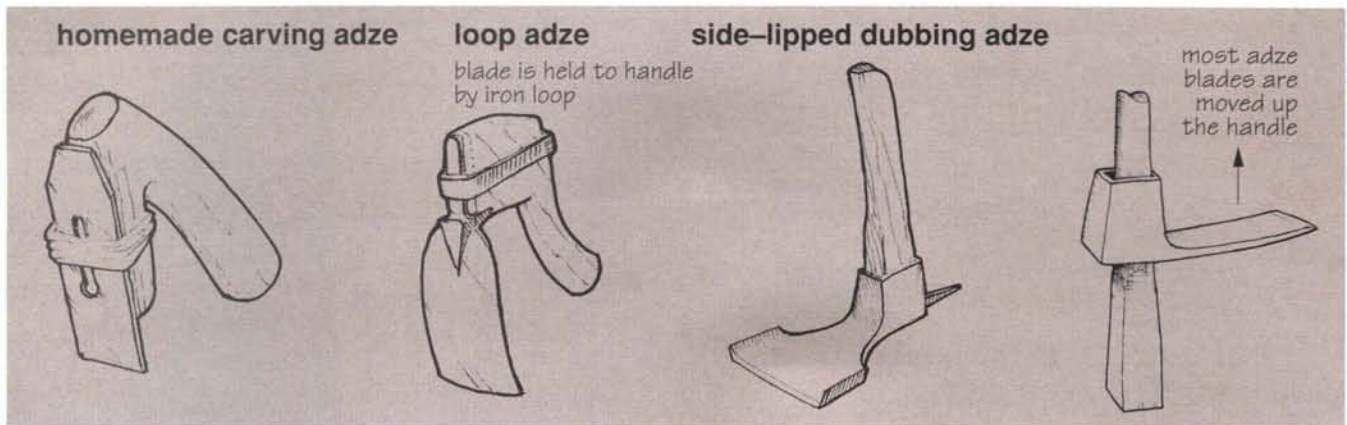
the long-handled form, used by shipwrights when building wooden vessels, when the word 'adze' is used. But of all the adzes—and there have been an enormous number invented over the years, including such arcane types as the bowl adze, Brazil adze, canoe adze, chairmaker's adze, claw adze, cleaving adze, cooper's adze, dubbing adze, fruit adze, gouge adze, guttering adze, ladle adze, loop adze, platelayer's adze, saucer adze, sear adze, slotting adze, spout adze, stirrup adze, trussing adze, Turkish adze, wheelwright's adze, and Yankee adze—the short-handled adzes are the oldest and most common; as well as being the type still most useful, like the one 'invented' by my friend the carver.

There is also an eponymous carpenter's adze. This is, in fact, the variety still available in many hardware stores, although the reasons for its original use seldom exist today. When framing timbers were still largely hand-hewn and not regularly sawn by sawmills, carpenters needed a tool to trim off bumps and lumps and reduce surfaces to an evenness suitable for the overlaying of roof boards or floorboards. Since this leveling process was typically performed after the particular timbers were already in place, it was not very easy to use an axe. The axe is more easily used perpendicularly to the worker than at the sideways angle that using it on fixed timbers makes necessary. By producing a tool whose handle emerged perpendicularly to the cutting edge, however, such leveling was made considerably easier. Today, few houses are built with anything other than sawn rafters and joists; but reflooring jobs and renovations still present the occasional timber or framing member that needs to be leveled, and a properly sharpened and skillfully used adze is one of the most efficient ways to do this.

There is a myth about adzes that is sometimes heard concerning the production of hand-hewn beams. Their production is often described as being the result of a series of vertical blows with the broad-axe followed by trimming with an adze. This procedure is possible, but was by no means the usual method; since it is far easier to trim such timbers by using the broad-axe on the side of the timber, for which purpose this tool was typically fitted with an offset handle. If any-

Graham Blackburn keeps his hatchet sharp in Inverness, California.



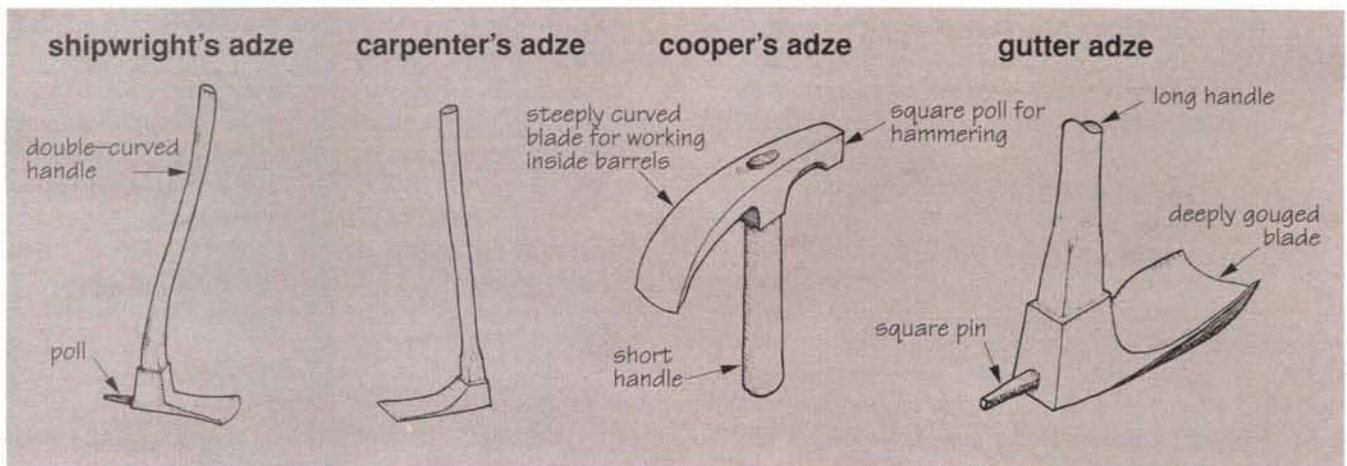


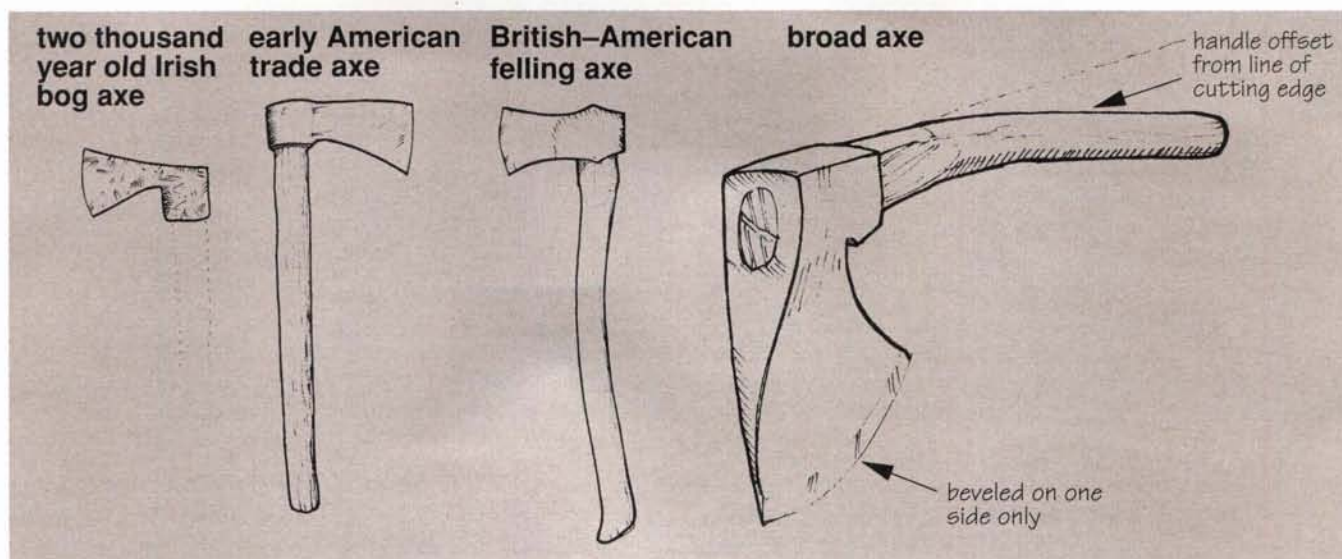
thing, the reverse procedure was more likely: a form of adze known as a dubbing adze, with upwardly turned edges, was sometimes used instead of the axe to cut the notches across the grain of a beam down to a chalk-marked line, and the broad-axe was then used to trim off the notched pieces.

As mentioned above, the tool that comes most readily to mind when 'adze' is mentioned is the ship-carpenter's, or shipwright's adze. This tool was used over a much longer period of time than the carpenter's adze. It is similar in most respects to the carpenter's adze, but it has a long poll or spike at the opposite end to the cutting edge. Such tools are still seen around boatyards where wooden vessels are built and repaired, and their use in the hands of a skilled worker is comparable to the work performed by a fine furniture maker. The precision with which such tools can be used, not only to remove large quantities of material quickly but also to take the most delicate shavings with great exactness from any particular area, is remarkable; especially since shipbuilding involves timbers that are rarely perfectly square and straight, almost every member of a boat being curved in at least one direction. The poll is used to sink any nails, left over from previous scaffolding, that might be encountered in the work below the working surface.

The haft, or handle, of a long-handled adze is often gracefully curved, in distinction to the straight handles found on other long-handled tools like the sledge hammer. These curves vary from one class of adze to another, being sometimes simple and sometimes compound, but all with the effect of making it easier to present the cutting edge at a more convenient and controllable angle to the work. This is understandably important since the blade is invariably swung towards the user. Another nickname for an adze is 'old shin splitter'! Shipwrights often use a double-curved handle that enables the end to be held against the user's knee so that the adze may be controlled in the manner of a hinge. Carpenters typically stand astride the work and swing the tool between their feet.

The cutting-edge profiles of various adzes, long and short, vary according to the job they are designed for. Most are curved and some are also crowned, although the carpenter's and shipwright's adzes generally have flat-backed blades. Deeply curved blades are useful for hollowing operations. Typical of these are gutter and trough adzes, and the still fairly common short-handle carving adzes. The latter work like scorp and inshaves, and are particularly useful for hollowing chair seats.





The Original Tool

Arguably the first tool used by mankind, along with the hammer and knife—all three in the shape of stones held in the hand—the axe is familiar to everyone. But as you would expect of a tool that has been used since the Stone Age, when it was literally a stone with one edge chipped into sharpness, it has undergone many changes and developed into numerous varieties. All, however, are instantly recognizable as the same tool: a broad metal blade fixed to a handle that lies in the same plane as the cutting edge.

Apart from its warring and hunting uses the axe was doubtless always intended primarily for use with wood. It is thus the grandfather of all woodworking tools, and every branch of woodworking throughout the ages has developed its own variety of axe suited especially to its own needs. These fall into two broad classes clearly differentiated by how the cutting edge is formed: single-beveled or double-beveled.

Until the advent of the saw, and more recently the chain-saw, the axe was the first and indispensable tool involved in all woodworking, for it was the axe that cut the tree down, trimmed the trunk, and chopped the wood into sections. For centuries, the axe and the adze were inseparable partners, between them performing the majority of all woodworking operations.

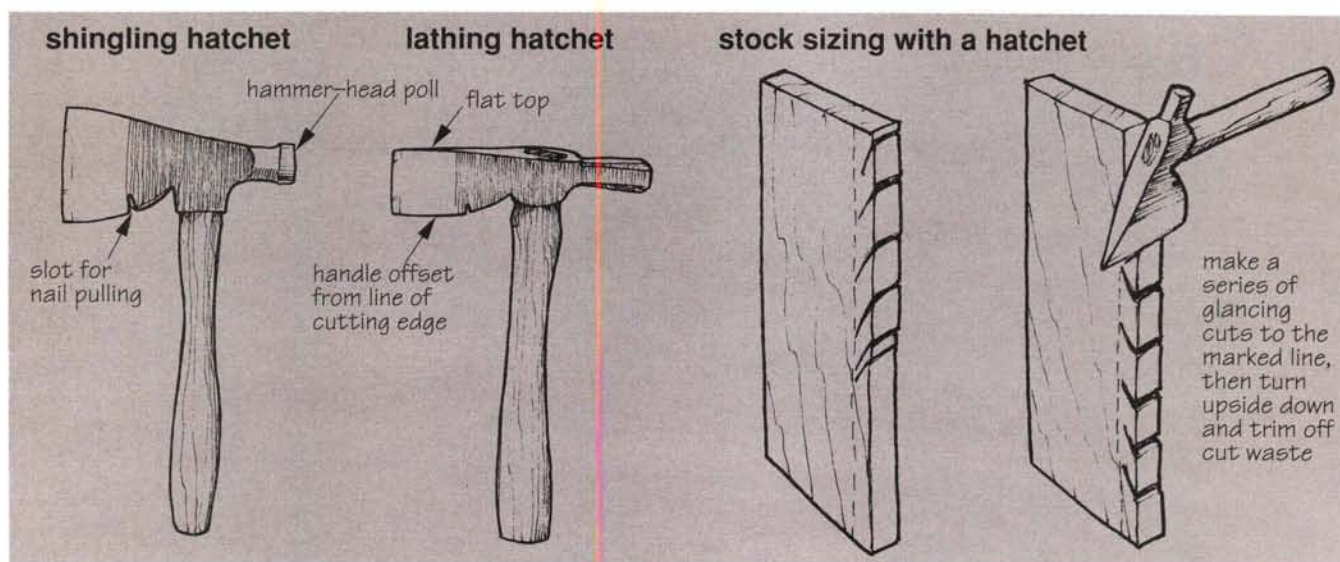
For the basic felling and trimming operations an axe was sharpened with a double bevel, that is, one on each side of the blade. This is the form found on large and small axes such as hand axes and felling axes. Axes two thousand years old dug up from Irish peat bogs are virtually identical to the first trade axes brought to America by the pioneers and used to clear the primeval forest and construct the first homes. But once the tree is on the ground and requires shaping into more manageable square timbers, a different kind of axe becomes more useful. This is the broad axe. Its

blade, as the name suggests, is much broader than that of felling axe; the cutting edge is longer although the distance from cutting edge to the socket for the handle is similar. The most important difference is that the cutting edge is sharpened only on one side, producing a single bevel, like the adze. This enables the tool to slice material from the wood and produce the desired planar surface. To provide clearance for the hand, the handle is tilted out of alignment with the cutting edge, away from the flat side of the blade. If a chalk line is snapped twice along the side of a log, and a series of transverse cuts are made connecting the parallel chalk lines, the broad axe can then be used to flatten the surface of the log by slicing off the wood thus cut. Repeating this process in such a way that the log is flattened on four equal sides produces a square timber. This is the way most building timbers were prepared until the advent of pitsaws and sawmills. It is, of course, equally possible to produce timbers with different numbers of (flattened) sides. Roof rafters were commonly flattened on only one or two sides. Hexagonal timbers are known in circular buildings or purely for ornament.

Hatchets: The Little Axe

Except for preservationists and a few people interested in constructing old-style post-and-beam buildings with hand-hewn beams, the broad axe has finally, after thousands of years' use, become obsolete. But the axe lives on, especially in the form of its smaller cousin the hatchet, whose name means simply 'little axe'. Apart from the common shingling hatchet used by roofers, the carpenter's hatchet can still find a useful place in the modern shop as a handy and quick roughing-out and trimming tool.

The shingling hatchet, incidentally, has become almost hopelessly confused in form and nomenclature with another form of hatchet, the lathing hatchet. The introduction of gypsum wallboard (known more commonly by its trade name of



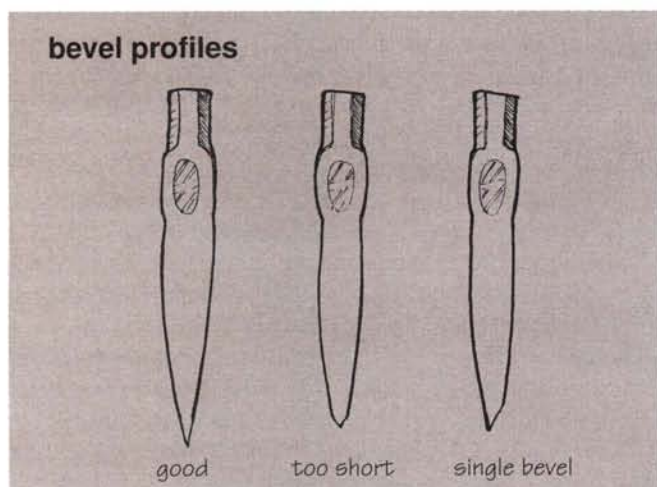
'sheet rock') has rendered the lathing hatchet completely obsolete, but its form lingers on in many so-called shingling hatchets. Both forms were provided with enlarged polls for driving nails, and very frequently also had a slot cut in the bottom of the blade with which to pull out nails. The lathing hatchet, however, was made with a flat top so it could work more closely to opposing surfaces and in tight corners, such as when fixing wooden lathing to walls and ceilings in corner situations. The shingling hatchet requires no such flat top and is properly provided with a symmetrical blade with a slightly curved cutting edge. Both tools are short-handled and designed to be used single-handedly—as are all hatchets—and are equally useful in the shop.

In the days before radial arm saws and table saws became universal equipment, the hatchet was the first tool used to trim boards to rough size. If the amount of waste is insufficient to produce a useful board in itself, it is quicker to trim the waste away with a hatchet than it is to saw it off. A

series of glancing cuts along the edge or surface to be trimmed can be smoothly sliced off with the hatchet used from the other direction. For round or curved work the hatchet is even more useful, and you will be surprised how often you will reach for the hatchet to shape a piece of wood once you get in the habit. The hatchet must be kept razor-sharp, of course, and care must be taken to see that the bevel does not become too fat. This is caused by allowing the bevel to shorten with each sharpening. The effect is to produce a wedge-shaped edge that creates ever more resistance to slicing through the wood, especially when cutting across the grain. Although hatchets are typically sharpened with double bevels like knives, single-beveled hatchets can be used in the manner of broad axes with useful results.

For similar reasons take care to maintain a curved profile. If the entire cutting edge contacts the work at once, the cutting action is made much harder than if the edge is introduced gradually, allowing each section to be separated bit by bit. Most importantly, always cut away from yourself and keep the hand that may be holding the work behind the edge. The hatchet can be used quite delicately; it does not always need to be swung in the manner of an axe but may often be used more like a knife. For preparatory rounding of items like handles or legs, as well as for the quick wasting of material around curved cuts that you will later fair with spokeshave or sander, the hatchet is ideal.

There are other roughing tools—such as broad knives, scorps, and inshaves—that, despite their name, may be used with great accuracy; but every woodworker should be familiar with adze, axe, and hatchet if only to maintain the connection that these quintessential tools have had with wood since it was first used as a material to enhance our lives. The hatchet especially deserves to be as omnipresent among woodworkers as the common knife; it will frequently prove a better choice than the table saw for much preparatory work. **PW**



Display Trays



by Percy Blandford

If you're like me, you have one or two place mats intended for use on the dining room table. They are particularly attractive, possibly gifts from family or souvenirs brought back from trips. Rather than just bring them out for occasional use under dishes, frame them as pictures.

Place mats are designed to absorb liquids and withstand heat—two qualities needed in a tray bottom. When not in use, stand your tray on edge and display the picture.

The mat controls the size of the tray. Most mats have wide borders, so you can do some trimming. As supplied, borders are not always cut equally, you might need to trim a little off the edges to balance their widths, even if the gen-

eral size is satisfactory. The dimensions given in the Cutting List are for a 11 $\frac{3}{4}$ " X 16 $\frac{3}{4}$ " place mat. You may need to adjust the tray frame size to suit your particular mat.

Mount the mat on a $\frac{1}{4}$ " plywood base (A) with contact adhesive and trim the edges to match. Use this base as a guide for sizing the other parts, as it has to fit closely into rabbets in the sides (B) and ends (C). The framing parts should be hardwood, those shown here are oak.

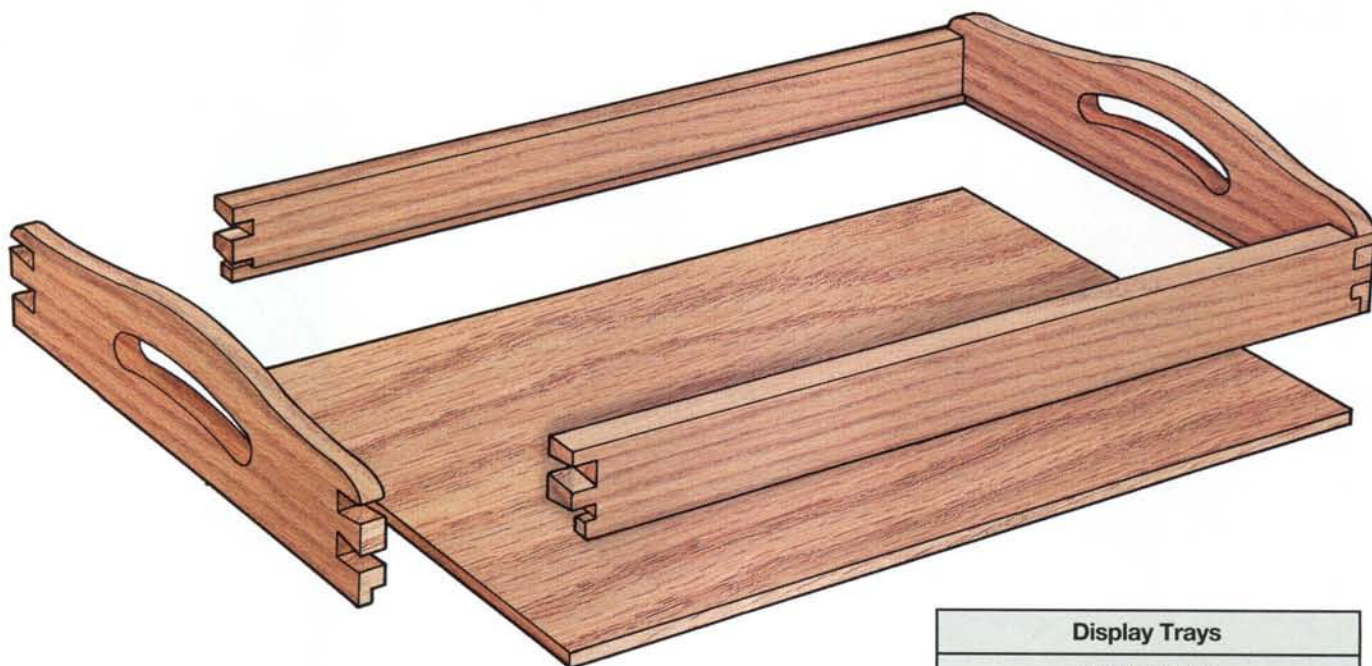
Use your own ideas for shaping the handle ends or choose one of the two end patterns included in the PullOut™ Plans. Note: the dimensions of the ends given in the Cutting List will give you sufficient stock to make either pattern. The tray sides can be left straight or the top edges shaped. Hand cut dovetails at the corners of the trays

look good and display your craftsmanship, but you can choose other joints, such as finger joints, if you prefer to machine-cut them.

Prepare the stock to width and thickness. Leave the pieces long until the rabbets have been cut and the corner joints laid out. Cut $\frac{3}{8}$ " X $\frac{3}{8}$ " deep rabbets in the inside face of the bottom of the ends and sides. The depth of the cut must be enough to accommodate the full thickness of the base. Mark the lengths and handle shapes, then cut the sides and ends to length. Don't cut the hand holes or the outlines until after the joints have been cut.

Make the dovetails as shown in Figure on the next page so the rabbet is covered by the half tail on the bottom of the sides. Leave a little excess length for final trimming. First, cut the joints on the ends then use them to

Percy Blandford, the author of 24 Router Projects, is a frequent contributor to Popular Woodworking, and lives in Warwickshire, England.



Display Trays					
Cutting List					
Qty	Prt	Rough Size			Piece
		T	W	L	
1	A	1/4"	12"	17"	base
1	B	5/8"	15/8"	17 1/2"	sides
1	C	5/8"	2 3/4"	12 1/2"	ends



Design your own pattern for the ends or choose from the two provided in the PullOut™ Plans.



Use spray mount adhesive to adhere your placemat to a plywood base. Cut the tray sides to fit the base.



The finished tray makes for a functional tea server while showing off your craftsmanship and placemats.

mark the dovetail pins and tails on the sides. When cutting the pins, allow projecting pieces at the bottom to fit into the end rabbets. Number the pairs of parts at each corner as you cut and fit them. It's unlikely that the joints will be interchangeable.

Slightly round the top edges of the sides and shape the ends to match each other. If using the angular pattern

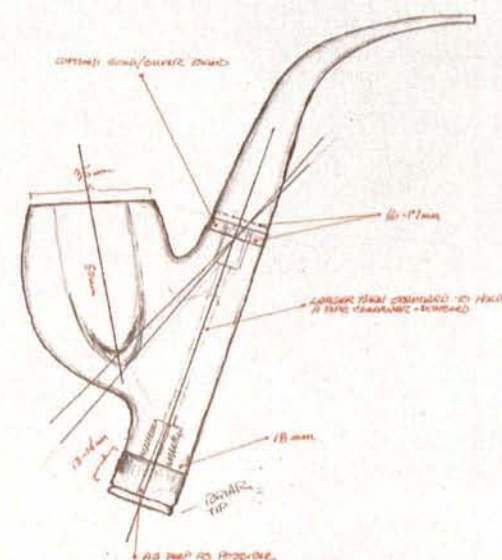
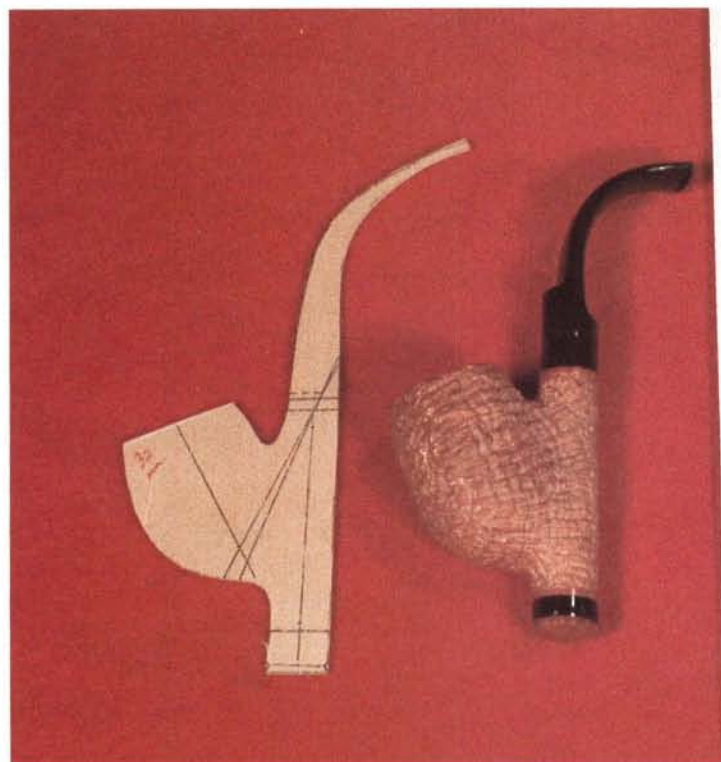
given in the PullOut™ Plans, slightly round over the corners. To make the curved slots in the rounded handles, drill end holes with a 1" Forstner bit then saw between them.

Clean off the frame parts and sand them before gluing the corner joints. Use the base to check the squareness of the assembly and level the outsides of the joints when the glue has set.

To attach the base, drill and countersink at 3" intervals for #4 X 3/4" FH woodscrews. Pass them through the base and into the frame parts. Before screwing in the base, finish the framework with a water-resistant polish or varnish.

Glue felt buttons or strips of cloth to the bottom of the base to protect your table top. **PW**

The Art of Making Pipes



by Jacob Schulzinger

With all of the negative press that tobacco has been receiving over the past few decades it might seem strange that anyone would want to study pipe making. Medical and political arguments aside, the processes involved in this skill will surely interest woodworkers even though they may not advocate the use of the end product. With that in mind, let's proceed and make the most of what we can learn from master pipe maker Mike Butera.

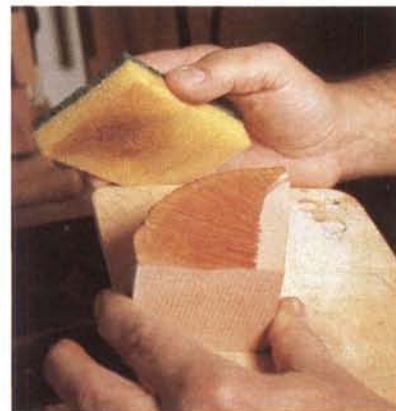
Hand-selected, super X, Corsican plateau briar is the stock used for a Butera pipe that is destined to become a collector quality piece. The outer layer of this plant root has the least amount of resin and moisture of the total root. The super X category defines the grain as being perfectly straight. As most woodworkers understand, the amount of moisture content in wood affects the way it will work, but in this case, it is the resin as well as the moisture content that make the difference in the quality of a smoking pipe.

A select piece of briar will be slowly air dried anywhere from 12 to 24 months before it is sorted and sold. During that time both the moisture and the resin contents decrease. This initial drying process is critical; the rough blank must be turned every three months so that each face is exposed, in turn, to free flowing air. Failure to turn the blanks can result in

cracks that will destroy the finished piece. The resin is what creates the biggest problem for the pipe smoker, as this is the substance that gives the tobacco a bitter taste.

Once the block of briar has been selected and sold to the pipe maker it will sit and cure for another three to five years before it is finally processed into a pipe. During this aging process, it's important that the wood breathe by having fresh air circulate around it, as it is the slow, natural drying that leaches the resins from the wood. By the time this select wood has reached its sixth or seventh year of drying it has given up almost all of the moisture and resins that it will release naturally. The dried wood is now ready to be processed by the pipe maker.

Design is the next step undertaken by the master pipe maker. In most cases, Butera's pipes are custom made and the basics of the design are defined by the customer. The specifications usually include bowl and tobacco chamber



Jacob Schulzinger is an industrial engineer in the aerospace industry.

size and shape, mouthpiece size and shape, finish and color. Once these have been identified it's time to draw out the design, full-size, and transfer it using carbon paper onto 1/16" thick plywood. The plywood of choice is the material that is sold for building model airplanes at most local hobby shops. A quick trip to the scroll saw brings the outline to rough size and judicious use of a sanding disc refines the shape.

With the wooden pattern in hand, Butera moves to his storage area, selects a bin containing the desired briar blanks, then tests the pattern with each of the likely candidates until he finds the one that fits the size defined by the pattern and his own stringent requirements. With the band saw, surfaces of the blank are trued up and then the design is transferred to the briar. To avoid mistakes, Butera uses a fine tipped, black marker to boldly mark the outline of the shape of the plywood pattern onto the blank. He omits transferring the shape of the mouthpiece and makes minimal allowance for cleanup of the bowl and stem. With the basic information on the blank it is time to transfer the most important data, the hole locations.

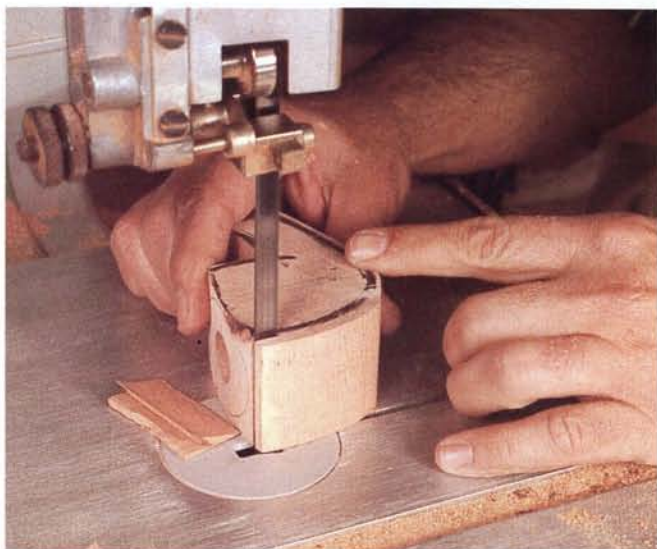
Smokers' pipes have three holes drilled in them that must be in a definite relationship to each other. They are the tobacco chamber, the mortise hole, and the air hole. The tobacco chamber, as the name implies, holds the tobacco to be burned; the mortise hole retains the mouthpiece in the pipe stem; while the air hole connects the mortise hole with the tobacco chamber and allows the smoke to flow into the mouthpiece. To achieve the best possible smoke, the air hole should run from the mortise hole directly into the lower portion of the tobacco chamber, ending up just above its absolute bottom so that the liquid condensate from the burning tobacco will not flood it. If one were dealing with straight line shapes it might not be too difficult a job to layout these lines; but with the constantly changing angles, material thickness, and hole size requirements of the custom built pipes that Butera manufactures, this is a job that requires a fresh and efficient approach.

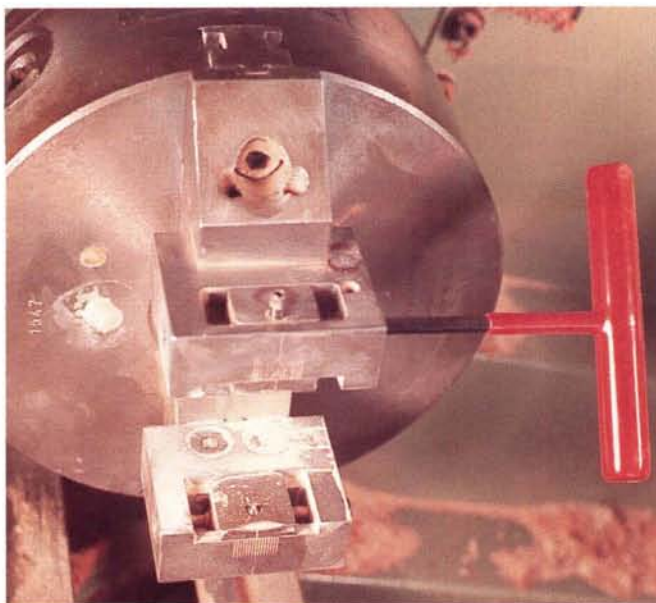
The chuck used on Butera's metalworking lathe is a standard two jaw, scroll-type, metalworking chuck that is self-centering and has a pair of custom built jaws added to the standard jaws that came with the unit. As can be seen in the photo, each of the supports that is attached to the original jaws is fitted with a precision adjustable offsetting mechanism; which has a hardened and ground locating pin positioned exactly 8 mm back from the front edge of the support. The offsetting mechanism is graduated for reference purposes and allows the user to move the center point of rotation off of the true centerline of the machine so that drilling or turning an off-center piece is made possible. The hardened and ground pivot pins, made from socket-head set screws, protrude from each of the support assemblies and are used as pivot points so that the work piece might be rotated about



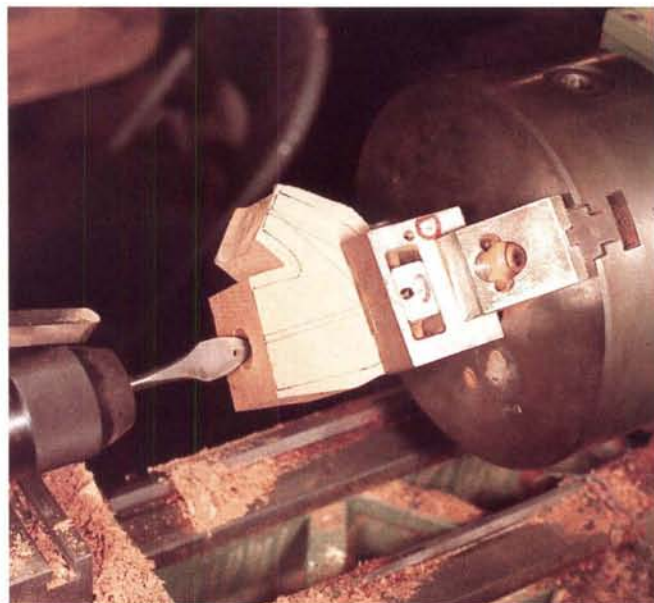
that position. By having a fixed pivot point, two or more holes may be drilled so that they will intersect at precisely the same spot.

Using the chuck is a fairly easy process. The blank is first trued up with a bandsaw so that there are parallel sides for clamping. The shape of the final part is laid out and the centerlines of all of the holes to be drilled are marked boldly on one face of the piece. An awl is used to mark the bottom point of the mortise hole as well as the common point where the air hole and the tobacco chamber holes should intersect. The hardened locating pins in each of the auxiliary clamping devices are retracted until only one protrudes slightly from the face of an auxiliary clamp, so that the awl hole in the work piece may be positioned on it. The chuck jaws are closed in the normal fashion; and as they clamp the wood,





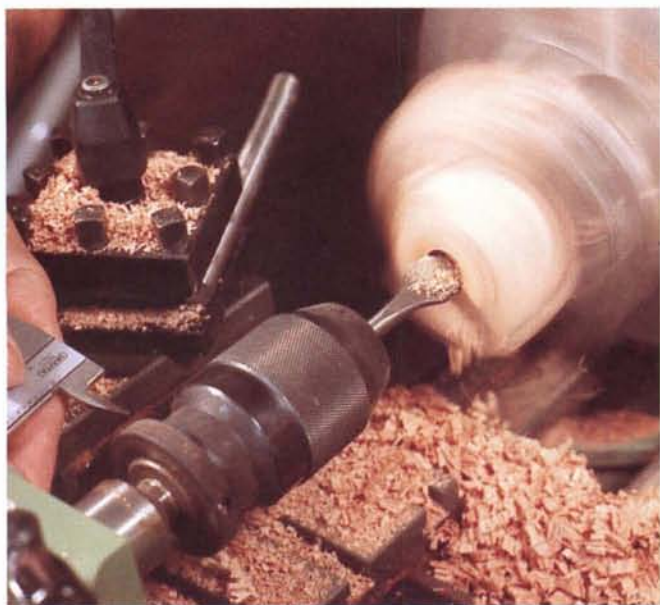
closed in the normal fashion; and as they clamp the wood, the hardened locating pin should be retracted until the wood just rests on it without resting on the face of the auxiliary jaw, thus allowing the part to pivot on the pin. Once the jaws are tight, the second pivot pin may be extended into the work piece. The centerline of the hole to be drilled is now squared up to the face of the chuck, using either a small square set against the chuck face or by eyeballing it to a drill mounted in the lathe's tailstock. Once the alignment has been made, the chuck is tightened in the usual manner. Measuring the distance from the face of the support jaw to the end of the part and adding to it the 8 mm distance from the face of the jaw to the center of the hardened pin will give the full depth of the drill hole. After drilling the hole, the chuck is loosened, the part rotated to the second position, the alignment process repeated and the second hole prepared in the same manner.



At this point both the mortise hole and the air hole have been drilled to their final size, but the tobacco chamber has only been roughed out. With the band saw, the outline of the pipe is roughed to shape and then the rest of the preliminary shaping is done with a sanding disc. Using files and a sanding disc, Mike Butera works the aged briar carefully to further develop the design that he has been visualizing since he first read his customer's order. It takes a sure hand to bring the wood to shape before the mouthpiece is inserted into the prepared stem of the pipe. The mouthpiece is also dressed down on the sanding disc until both it and the briar have the approximate shape of the finished product. A quick final check for holes and inclusions in the briar (the root can engulf pieces of sand as it grows) and it's time to set the piece aside until the next working session.

Mike plans his work so that one week will be devoted to





the roughing process, the next to the final shaping, and the last to the final bowl treatment. In between the roughing and the final shaping is one of the two processes that no pipe maker will discuss in any detail; that is the curing of the briar. This process is always proprietary, varies from one pipe maker to the next, and is one of the two processes that makes the difference between a good and a bad smoke. While we may have no idea what processes are involved in the curing, we do know that as a result of this process more of the natural resins and acids are removed from the piece, the briar loses a good portion of its weight, and the hole bored for the tobacco chamber distorts so that rebor-ing is needed. That's all most pipe makers, including Mike Butera, will say about curing.

The final shaping is one of the features that Butera's customers always specify; as it is something that they must feel



and live with as long as they own the pipe. Many smokers prefer a rough finish, as it presents more bowl surface area to the air so the pipe will smoke a bit cooler than one with a smooth finish. These roughed up pieces will also pick up their own coloration from the natural oils on the users' hands and will develop very rich patinas over time. To prepare a finish of this type, Mike forces the bowl of the pipe over a plug that is clamped in a vise and works it with a small gouge. There's no special pattern to his movements, it's just a matter of gouging to prepare the work for the next step. Using a home built tool that is made from several 8d nails, the pipe is literally attacked to form a random pattern of hills and valleys. After the gouging takes place, the high spots and sharp points are removed by vigorous brushing with a wire brush and then followed up with a brushing from a short-bristled brush. At this point there should be no smooth areas on the outside of the bowl. Final shaping and polishing of the mouthpiece complete the bulk of the work on this pipe.

The last step in the manufacturing of a quality pipe is the bowl treatment. Like the curing, this is another proprietary process that no pipe maker will discuss in any detail except to say what is not done. The final treatment is what prepares the bowl for the breaking-in process. During this operation the first bowls of tobacco burned in a pipe actually result in the inside of the bowl being scorched and a layer of carbon deposited thereon. Once the layer of carbon has been developed there is little, if any, of the bowl that actually burns. The breaking-in process has always been a task that most pipe smokers have hated because of the bad tastes that usually accompany it. Mike Butera's customers claim that his pipes have minimal taste variations between the break in process and the mature pipe—a fine tribute to his methods. **DW**





Coffee Table

This master craftsman project is thoughtfully designed—simple, attractive and functional. Ken's instructions are well thought out and accurately explained. As with most projects, the wood dictates much of the finished shape. Keep an eye on the sequence of steps rather than the dimensions given for its parts.

by Ken Sadler

The Shakers created beautiful furniture with plain and simple lines; but it was austere, as befitted people whose religion and lifestyle were the same. When I started designing furniture I was quite attracted to the Shaker style and built a number of pieces that could be called copies. As I progressed as a furniture maker, I found that many people were put off by the austerity, but liked the simple, plain lines. Since success in the hand-crafted furniture business requires that you make what people will buy, I began to mute the austerity by using curved lines rather than straight, and rounded corners rather than sharp. As this progressed, a new style evolved and the coffee table in this story is an example of it.

This table is relatively easy to build, but building it avoiding complications requires a certain progression of steps that I will explain and I strongly suggest you follow. You'll need two feet, the blanks for which finish 2" X 4" X 18"; two top supports whose blanks finish $\frac{3}{4}$ " X 3" X 14 $\frac{3}{4}$ "; four leg blanks that finish 1 $\frac{1}{2}$ " square x 15"; one spreader blank $\frac{3}{4}$ " X 3" X 34" ; and the top. When making the spreader blank, make an additional piece exactly the same thickness, 2" wide and 19" long. This piece is very important in the layout and assembly operations.

The Top

If you find the right board, you can wind up with an exceedingly beautiful piece of furniture. Search for a board 2" X 12" X 46" with a grain pattern that, when laid open in a book match, will create a striking picture. Finding such a board takes time and patience, but the result is well worth it. The board will probably be in the rough. On one end draw centerlines across the width and thickness. Looking at the end, mark the top sections, from the left, 1 and 2, and the bottom sections, from the right, 3 and 4. Rip the board to separate sections 1 and 4 from 2 and 3. Use a planer blade on your table saw to get the thinnest and smoothest cut you can. Surface the two faces and outer edge of each piece. Make sure that the edge is square with the surfaces. Do not do anything to the cut edge unless it is out of square with the surfaces. If it is, square it with as few cuts as possible. Now resaw the two pieces down the centerline across the width, separating sections 1 and 4 and sections 2 and 3. Lay all four pieces on the bench with the resawn surfaces up and numbering from the right 1, 2, 3, and 4. Put an arrow on the end of each piece pointing to the resawn surface. Take light cuts on the jointer from the resawn faces until the saw marks are gone.

Lay them out on the bench again and adjust them lengthwise until the grain lines match, then, with chalk, draw a large triangle across all four faces. This is so that when you separate them to apply glue to the edges you won't make a mistake in putting them back together. Now go ahead and edge glue them together. Set the clamped-up panel aside to dry.

The Legs

The next step is to put the tenons on the legs. Do this before you shape them. The simplest way to cut these tenons is as follows: Put a full dado head on the table saw ($\frac{3}{4}$ ") and attach an auxiliary fence to the rip fence. Cut out this fence so it can extend over the dado head. Set the dado head for a $\frac{3}{8}$ " deep cut and the fence $\frac{3}{4}$ " from the far side of the dado head. Select one surface of each leg and mark it "back", also mark the ends, "top" and "bottom". With the bottom against the auxiliary fence, cut all four tenon sides on each leg. Put the top against the fence and make the same cut on the two sides. Reset the dado head to $\frac{1}{4}$ " and with the back face down, make the cut. Reset the dado head to $\frac{1}{2}$ " and with the front face down, make the cut. Number the legs on the back face.

Choose one 4" x 18" face of the foot blanks as the top and mark it. Draw a centerline on the length and one on the width of this face. Do the same with the top support blanks, in this case on both faces. This is where that extra piece of spreader stock is used. Cut two pieces from it 9 $\frac{1}{4}$ " long. On one edge of each draw a centerline down the length. Place legs 1 and 2 back to back with the spreader stock piece between and flush with the shoulders of the bottom tenons and clamp them together. Do the same with legs 3 and 4. Place this assembly on the top face of the foot so that the centerline of the spreader stock matches the centerline across the width of the foot, and mark on the foot, with a sharp knife, the lengthwise limits of the mortises. Measure the width of the tenon, splitting this distance across the lengthwise centerline of the foot, and mark the sides of the mortises. Using the marks just made, cut the mortises $1\frac{3}{16}$ " deep. The extra depth is to make sure the joint goes home even if there is a little too much glue. Leave the legs clamped together and fit them to the mortises this way. Make sure that the joints go home and that the shoulders are against the foot all around. The joints should be a snug hand fit. Mark each foot with the leg numbers you fitted to it.

Move the spreader stock to make it flush with the top tenon shoulders and reclamp. Repeat this procedure on the top supports, only here mark both faces. This allows you to cut the through mortise from both faces and thus make sure that it's square with the faces. Again, fit the clamped up legs to the mortises with the same fit as in the feet. Mark each support with the leg numbers you fitted to it. Assemble each group and mark one assembly left, the other right, and mark "front" on one end of each foot.



Choose a straight and solid board for the top. Mark centerlines across the width and thickness of the board.



Clamp two legs together with the spacer between them and mark the location of the mortises in the feet. Mark each leg and its corresponding mortise.



Dry assemble the table base with the spreader blank supported by the spacers. Center the spreader blank and mark lines on each side of the legs.

The Spreader

Lay out the spreader and drill the holes for the blind dowel joint with the legs. On the spreader blank, draw a lengthwise and a crosswise centerline; then 15" out on each side of the crosswise centerline draw the leg centerlines. On each end of the spreader drill $\frac{3}{8}$ " diameter holes on the leg centerlines 1 $\frac{1}{2}$ " apart and $\frac{3}{4}$ " from each edge. Do this on a drill press so the holes are perpendicular to the face. Now comes the job of locating the blind holes in the legs. Place the left leg assembly on the workbench, with the end marked front, flush and square with the front edge of the bench. Clamp it firmly in place. Put the piece of spreader stock between the legs, resting on the foot as a spacer. Slide the spreader blank between the legs and rest it on the spacer. Place the right leg assembly with the other piece of spreader stock in place on the bench and slide the right end of the spreader blank between the legs. Set the right leg assembly so there is exactly 26" between the feet at the front and back and clamp it in place. Adjust the spreader so the crosswise centerline is exactly halfway between the leg assemblies. On both front and back sides of the spreader mark the inside edge of each leg assembly.

Without unclamping the feet from the workbench, remove the top supports and the front legs. Clamp the spacers to the back leg and make sure the line drawn on the spreader and the leg line up, then clamp one end of the spreader. Using a $\frac{3}{8}$ " brad point drill bit, mark the hole locations on the back face of the left and right legs. Follow the same process for the front legs. Now drill, on the marks just made, $\frac{3}{8}$ " diameter holes, $\frac{9}{16}$ " deep. Do this on a drill press to make sure the holes are square with the face. Cut four pieces of $\frac{3}{8}$ " dowel to 1 $\frac{3}{4}$ " long. Size them so they're an easy push fit in the holes in the spreader. Place the dowels in the spreader, protruding $\frac{1}{2}$ " on each side, assemble the legs to the spreader, then fit them to the feet and top supports. See that all joints fit properly, that the legs in each assembly are square with the spreader, the foot and the top support. Also, check that the feet and top supports of one assembly are parallel with those of the other.

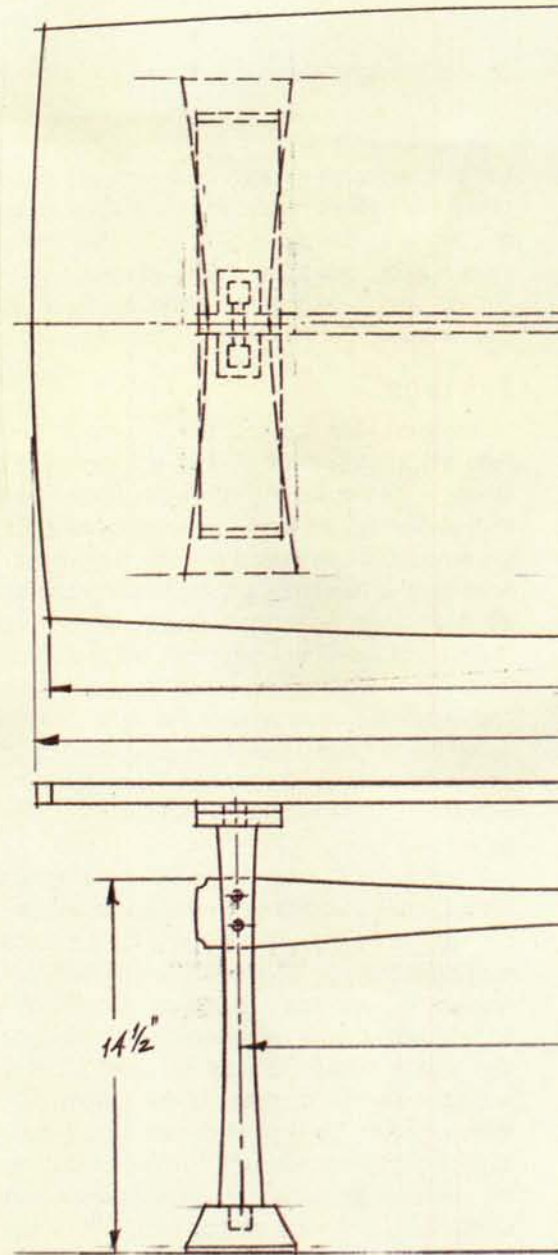
Shaping

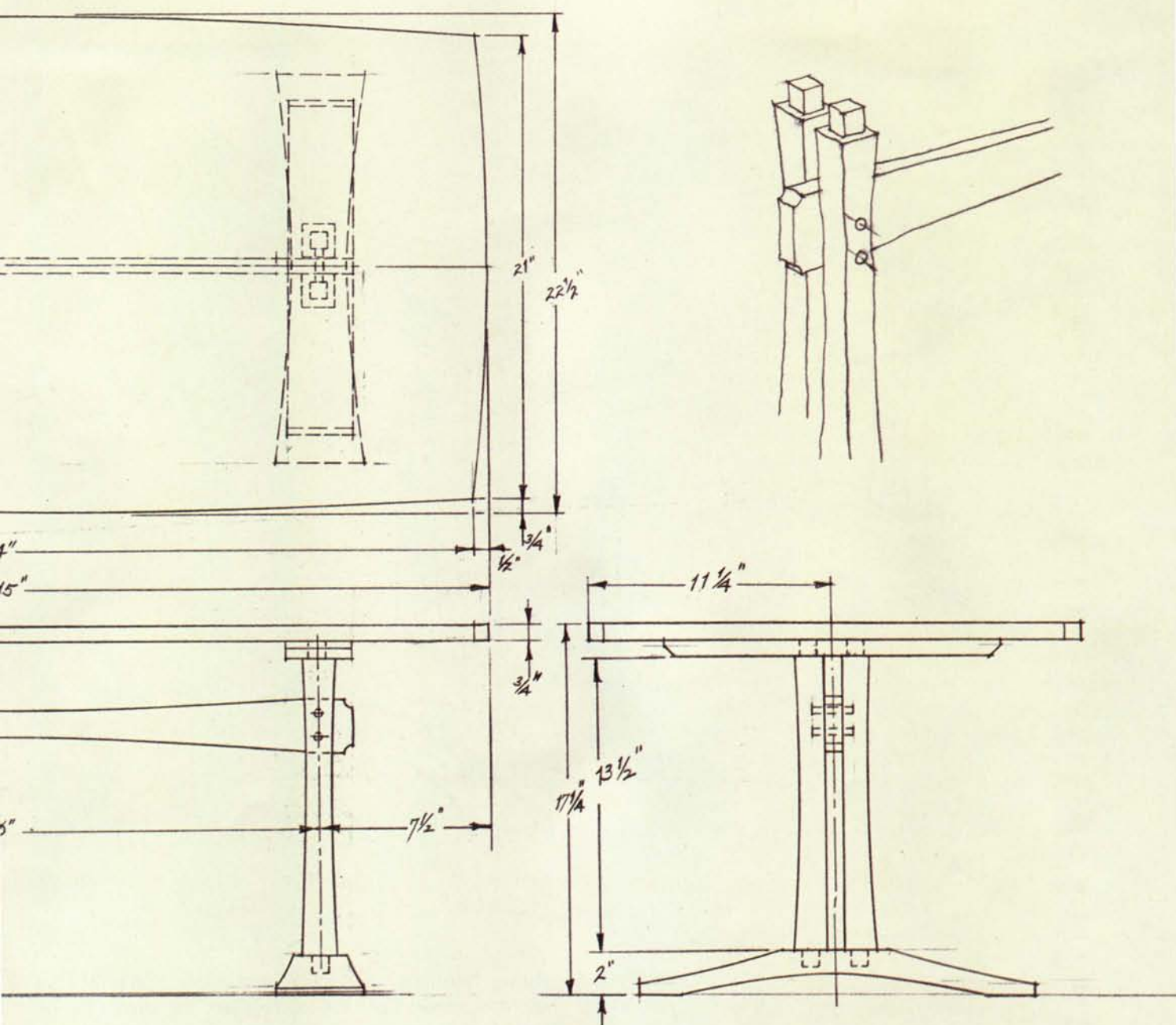
The various parts can now be shaped. Start with the feet. Using the full size side template in the Pullout™ Plans, draw the shape on one side of each foot and bandsaw leaving the line. Put the top template in place, draw the shape, and bandsaw leaving the lines. Clean up the sawn surfaces with a spoke shave, round all corners except those of the area that will be on the floor and finish sand. It is important here to make the saw cuts in the order I've stated. If you reverse them, you'll have lots of trouble cutting the side shape.

Shape the legs next. Use the templates in the Pullout™ Plans. Again, draw and cut the shape using the side template first, bandsaw leaving the line, then draw the front template and cut the shape. Clean up the sawn surfaces with a spoke shave, round all four corners, and finish sand.

There's no template for the spreader, just lay it out from the centerlines. Here's an easy way to draw those long shallow curves. Get a stick, about $\frac{1}{8}$ " X $\frac{3}{16}$ " X 4" long. Clamp small blocks to the spreader so that one corner of each block is 2 $\frac{1}{2}$ " from each end of the spreader. This is where the curve begins and ends. Now, placing the stick flat with the edge against the block corners, pull the center into position at the high point ($\frac{3}{8}$ " offset for the top and $\frac{3}{4}$ " for the bottom) of the curve on the centerline. Hold it there and draw the line. Bandsaw the shape, clean up with the spokeshave, break all corners except those on the straight sections that go between the legs, and finish sand.

Draw centerlines on the face of each support. Make four $\frac{3}{16}$ " X $\frac{3}{8}$ " slots in each support for the mounting screws. Refer to the perspective illustration for the general location of the slots.

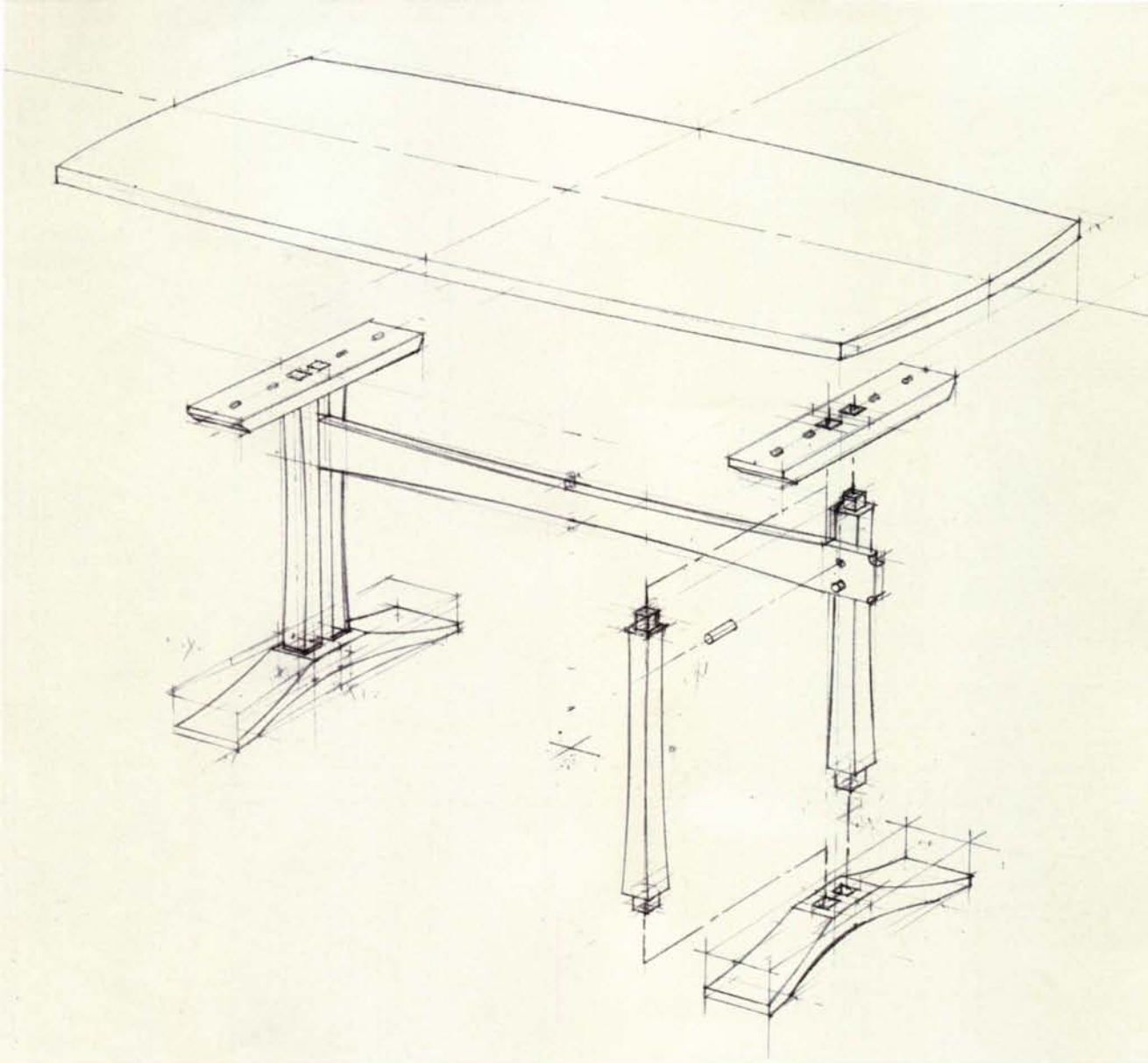




Shaping the Top

At this point it is best to dry assemble the base to make certain that everything fits and lines up properly. When you're satisfied with the shape and fit, take it apart, apply glue and reassemble. Use clamps where necessary to hold things in place. Here are some pointers on applying glue: Never put it on the tenons or dowels, always in the mortise or dowel hole, and then only on the top half of the sides where the introduction of the tenon or dowel will wipe it down over the rest of the side. Never put glue on the tenon shoulders. It's easy to get too much and then it will squirt out and make a mess. If it does squeeze out of a joint, don't wipe it up. You will only drive it into the pores of the wood and then you'll never get it out. Let it dry and clean it up with a sharp chisel.

At last we come to the glory of the whole piece, the top. Lay it on the bench, face up, clean off any glue that extruded from the joints and smooth the surface with a hand plane. Do the same for the bottom. When you turn it over, place some heavy towels between it and the bench top. You don't want to take a chance on scarring the top while working on the bottom. Lay out the shape according to the top view. Draw the centerlines first and work from them. Here again, use the stick to make the curves. Instead of using blocks, drive small brads just off what will be the corners of the finished top. Pull the stick against those to make the curve. Bandsaw the shape leaving the line and clean up the edges with a spoke shave. I suggest slightly rounding the corners of the bottom. However, for the top, cut a small 1/8" bevel with a spoke-



shave. That little bevel looks much more elegant than a rounded corner. Sand the top face and the edges, but be careful not to break the corners of the bevel—they should be left sharp. If you used a sharp blade in your spokeshave you shouldn't have to sand the bevel. Position the base structure on the underside of the top according to the side view and attach it with #8 X 1 1/4" round head wood screws placed in the center of the slots.

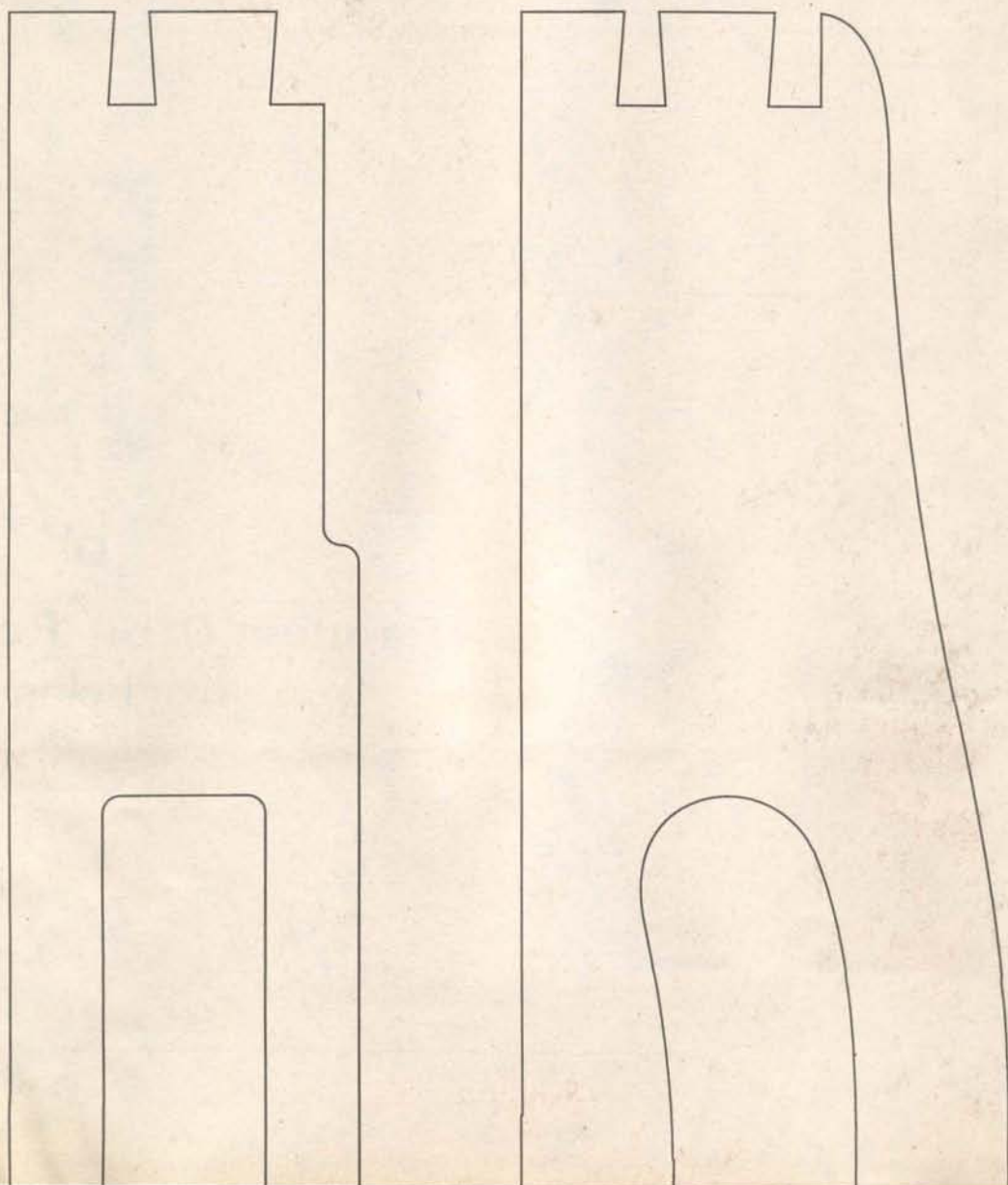
Finishing

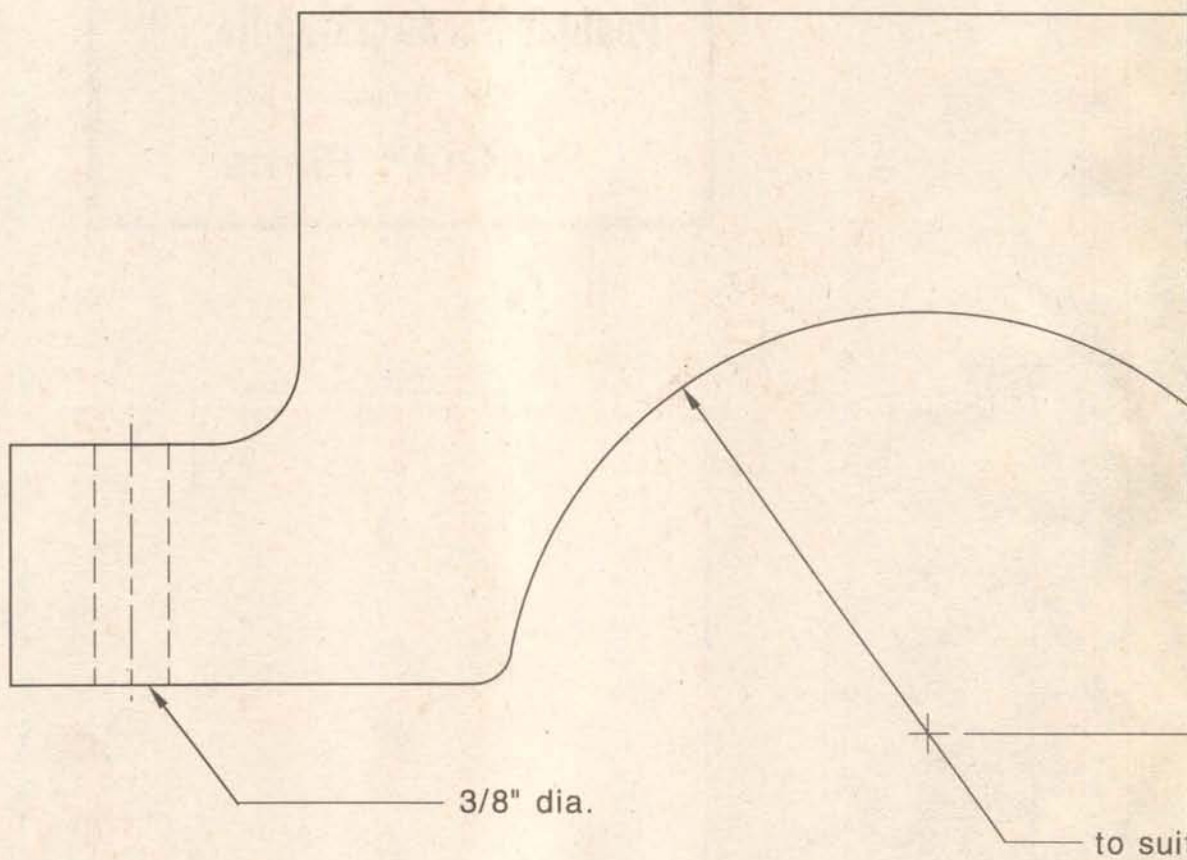
I'll make the same statement I always make at this point; however you finish this piece don't use any stain. It will only muddy and spoil the grain patterns that you have spent so much time searching for. In my work today I use Formby's™ low gloss tung oil finish. Use two or three coats of this followed by as many coats of paste wax as is needed to get the sheen you want. The denser the wood, the less coats it will take. Don't use a liquid or spray-on wax. They don't do a very good job and the water in them may ruin the tung oil finish you've already applied. **PW**

Popular Woodworking No. 79

July 1994 (pages 39-54)

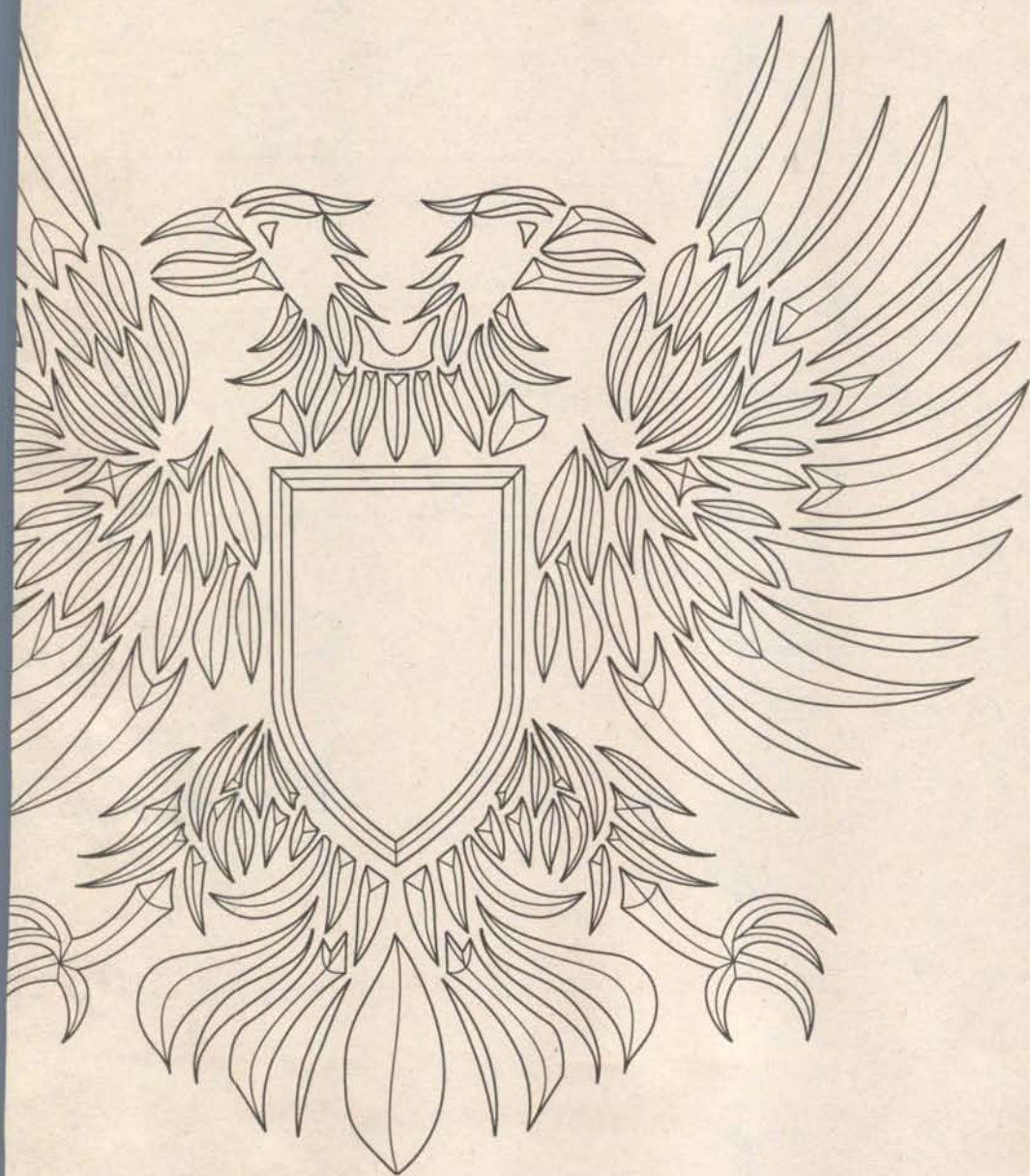
PullOut™ Plans



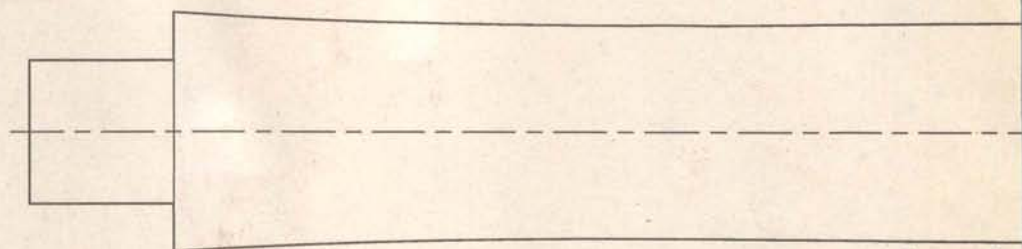


D

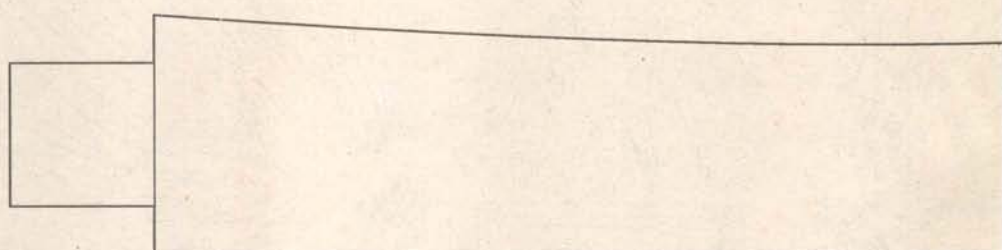
Random Orbit Pad Sander
fixed clamp



Chip Carving
plaque

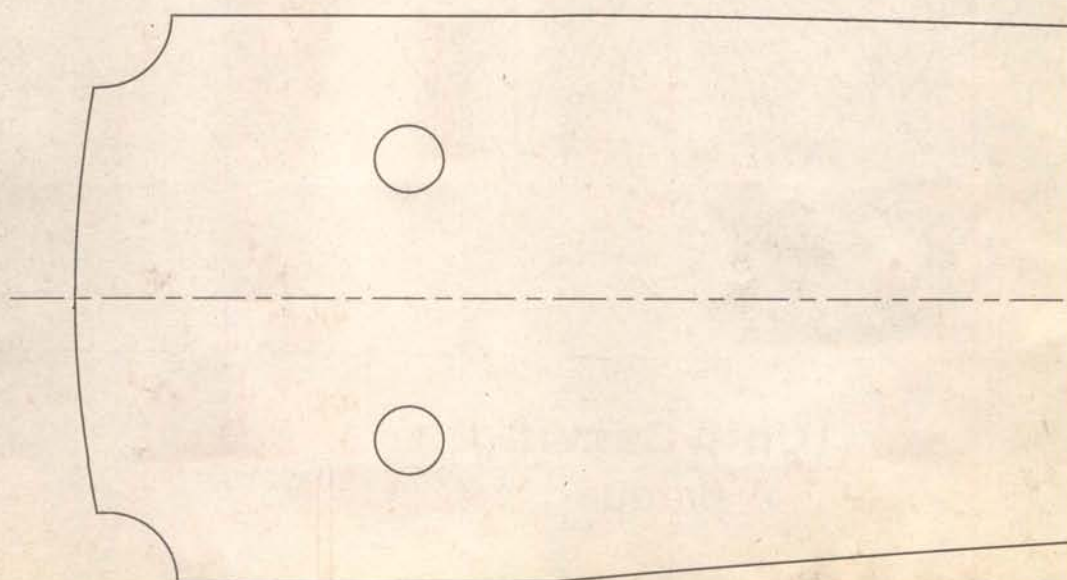


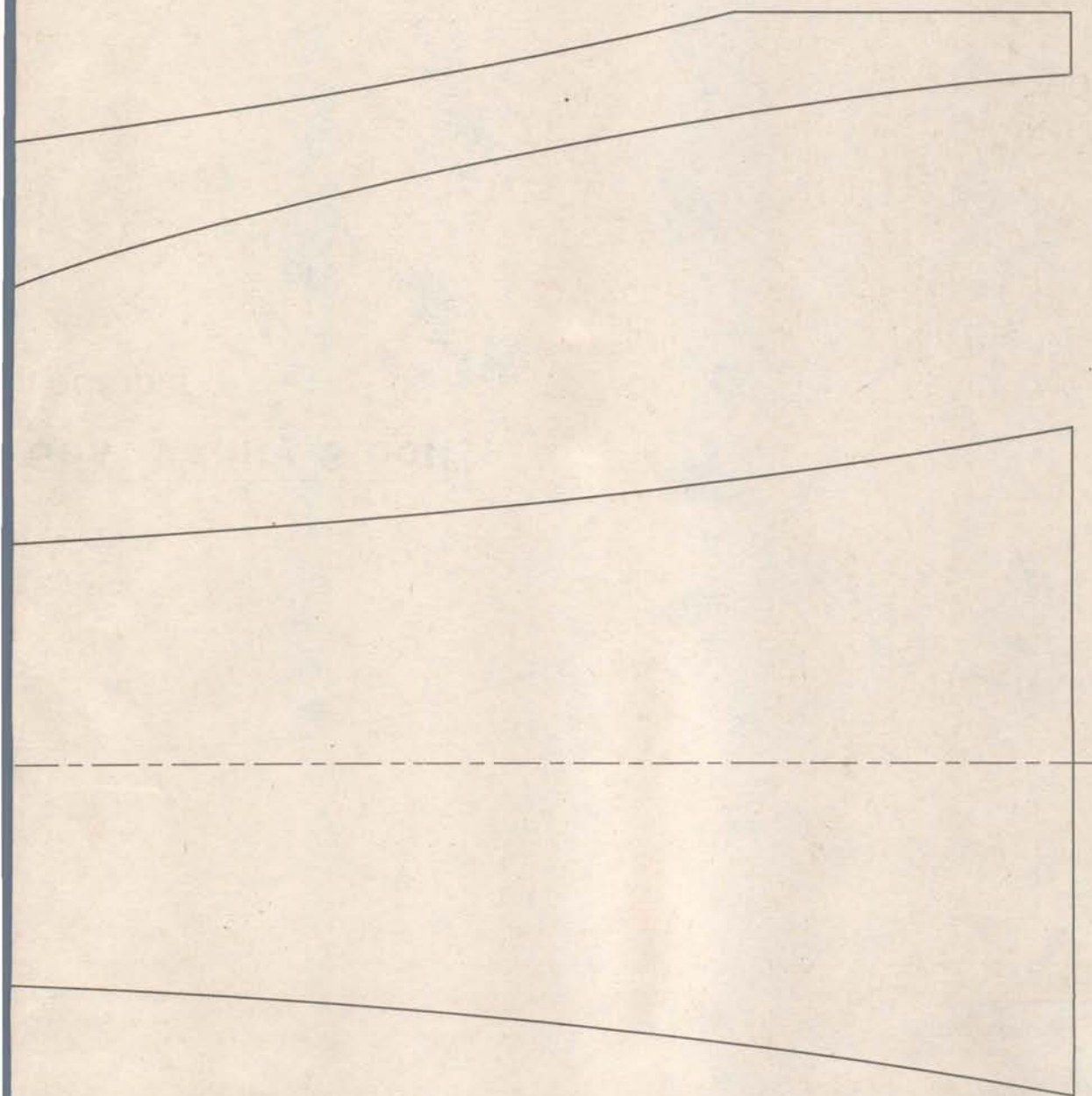
leg fr



leg s

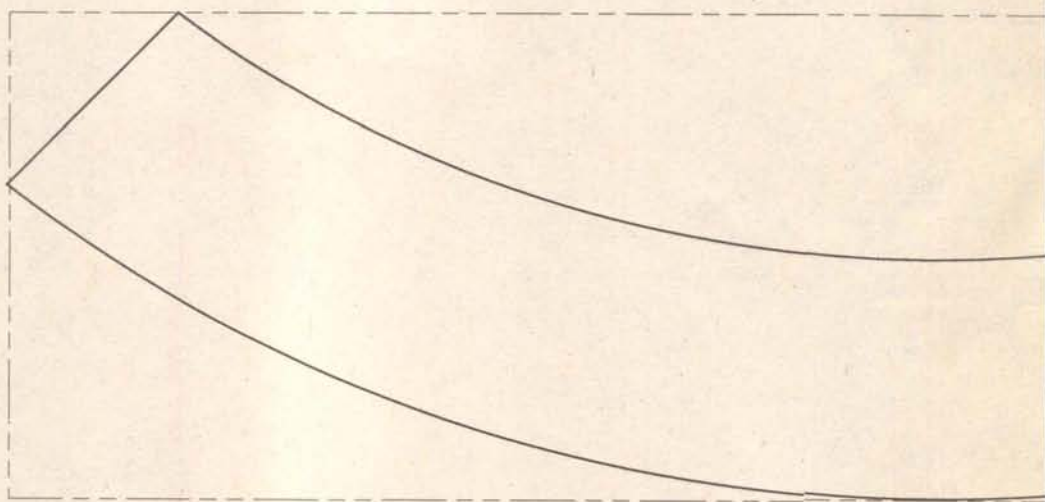
Coffe

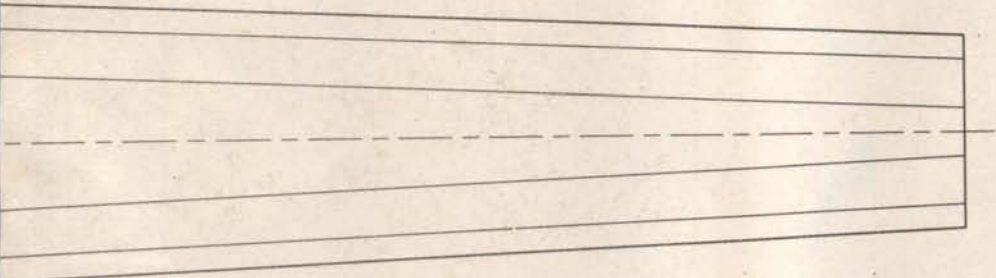
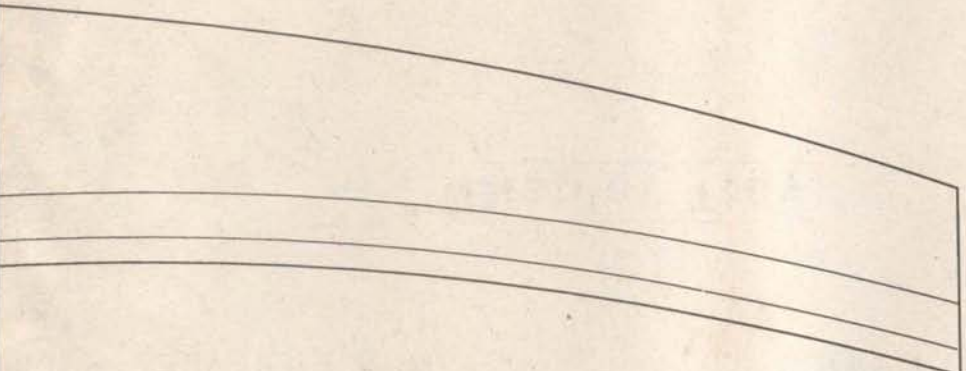




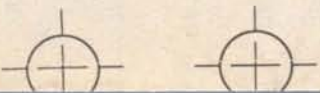
quadrants

Seat Vanity Stool





Random



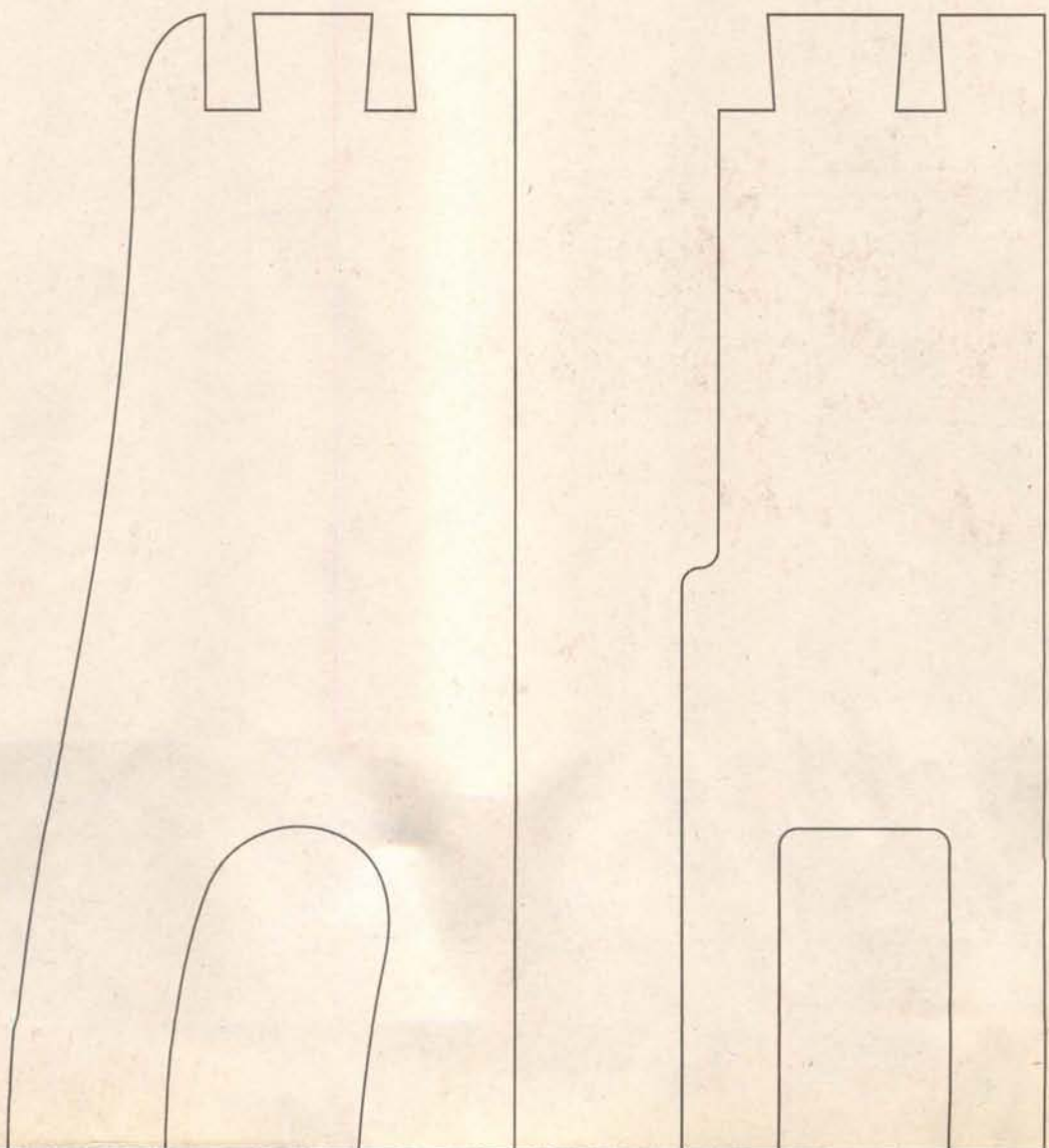
Carefully open staples to remove plans, then bend them closed again.

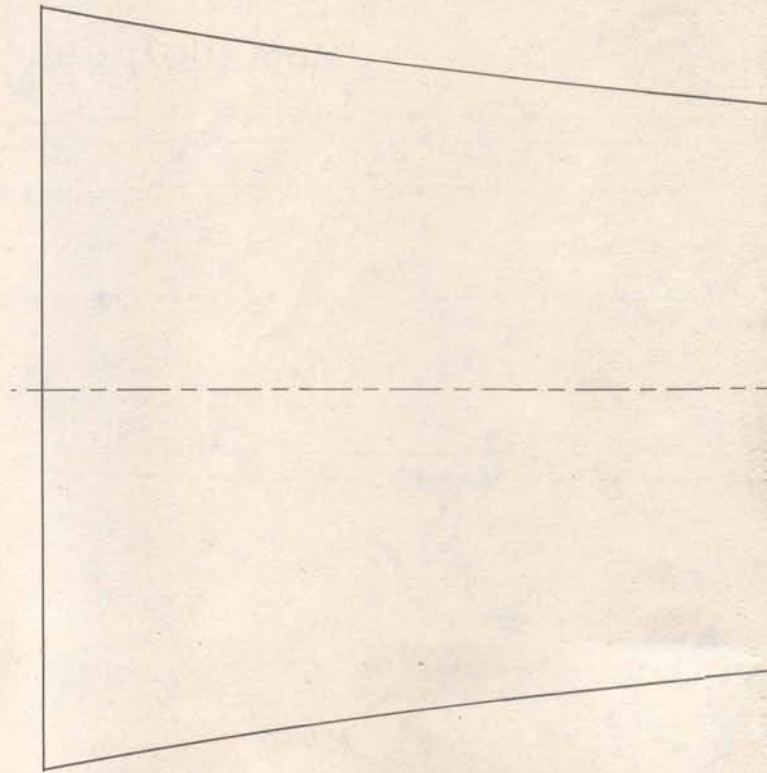
Display Tray

©

straight end

curved end





Swivel Seat Vanity Stool

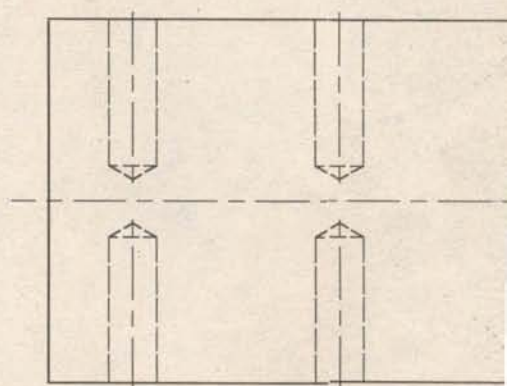
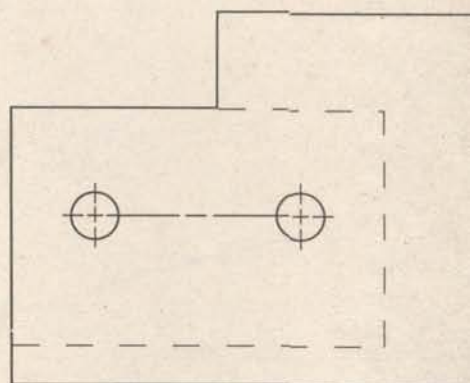
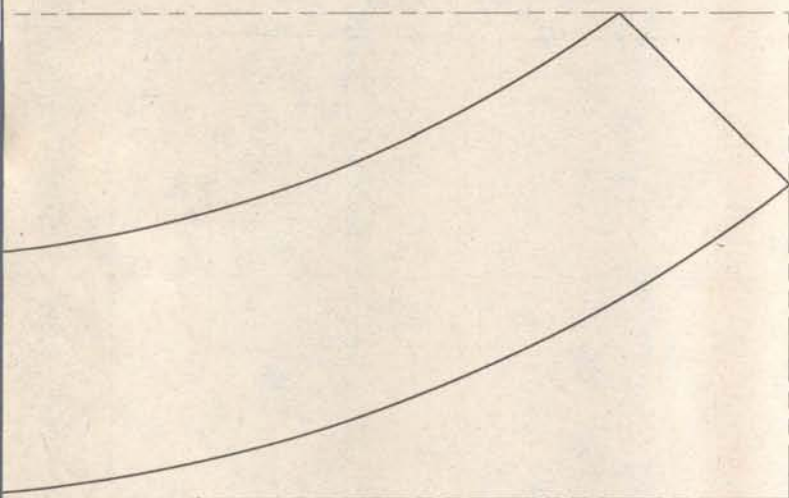
leg side view

leg front view

Orbit Pad Sander
arms

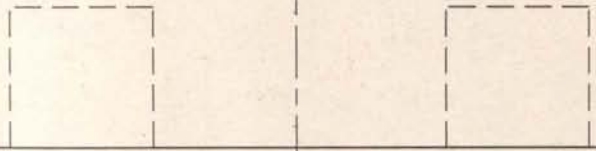
(K)

Swive



Coffee Table

foot side view



foot top view



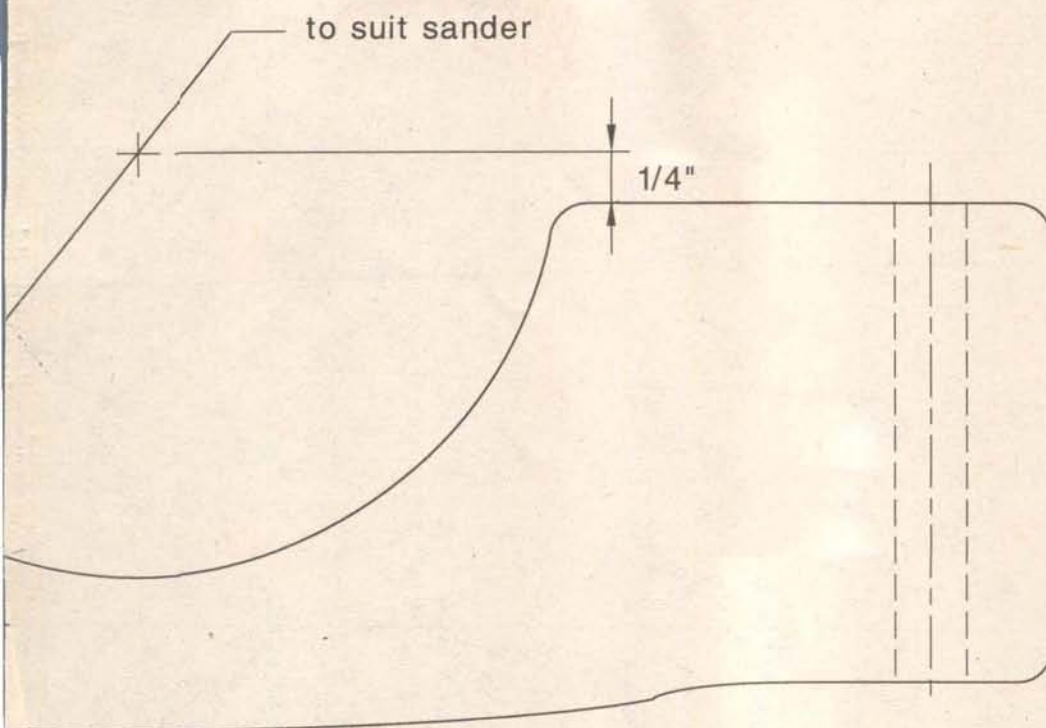
stretcher

Coffee Table

nt view

de view

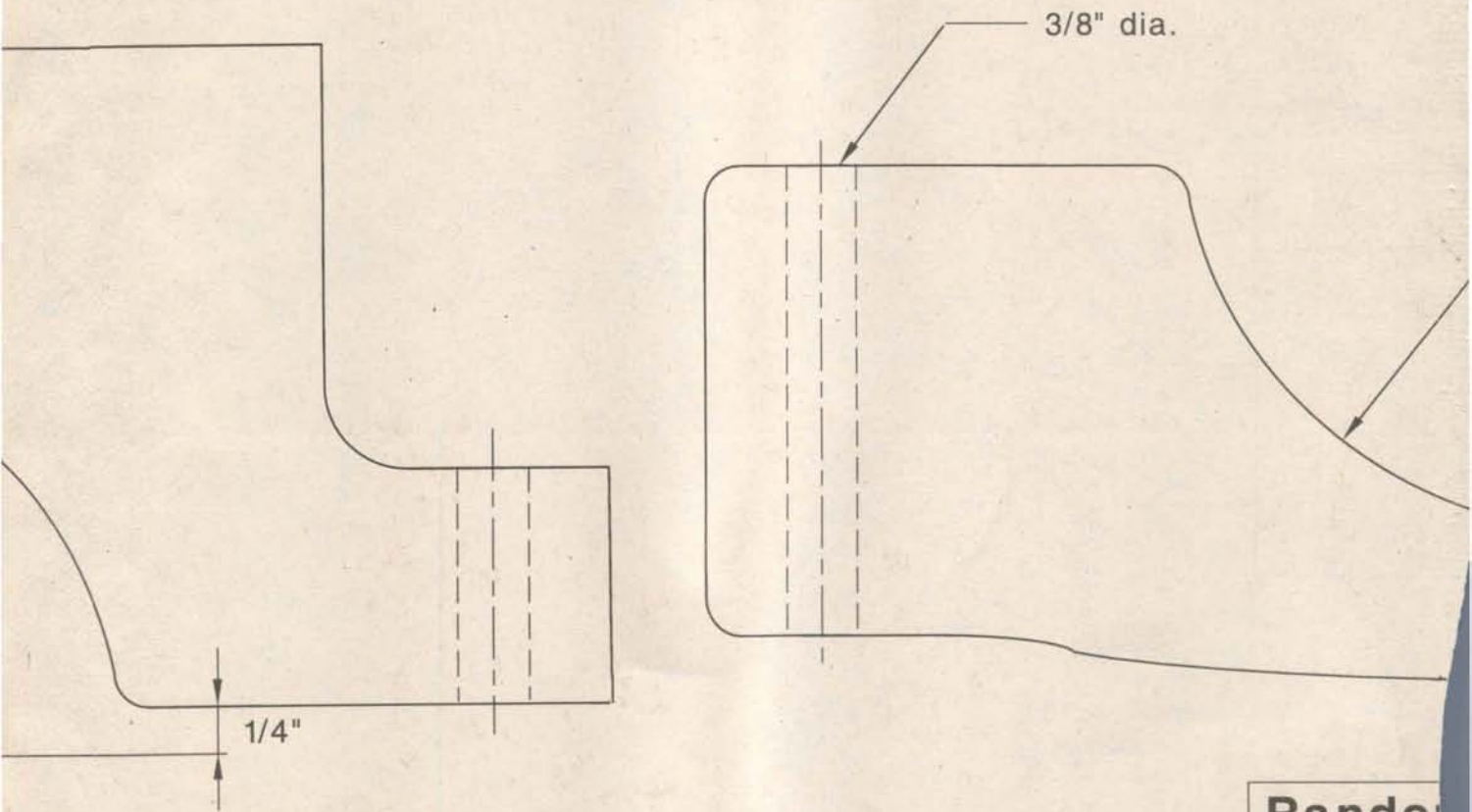
Table



(E)

Orbit Pad Sander

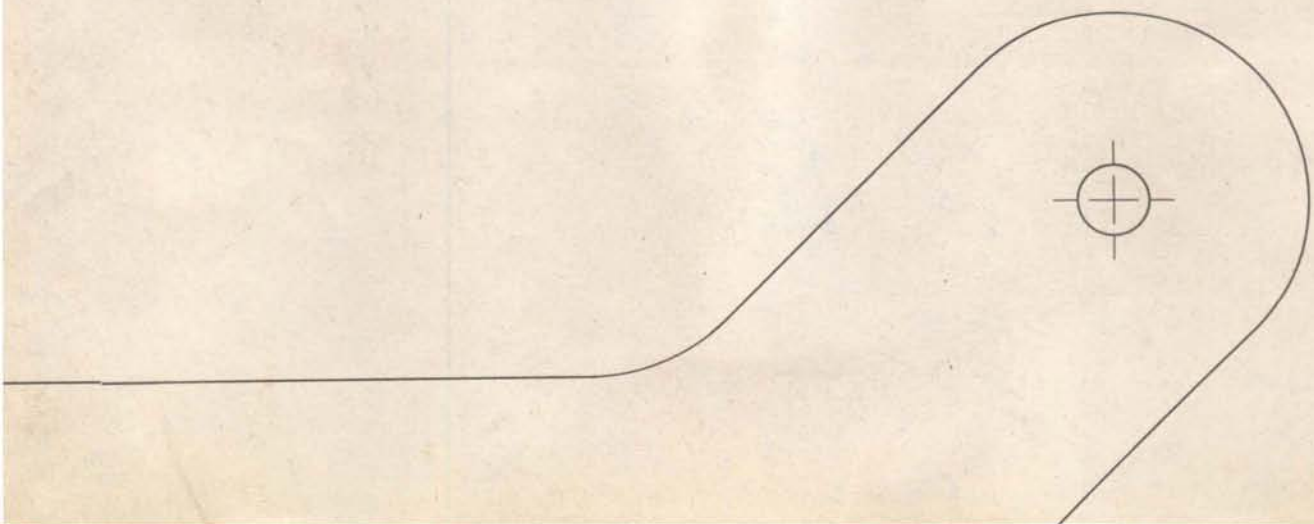
vable clamp

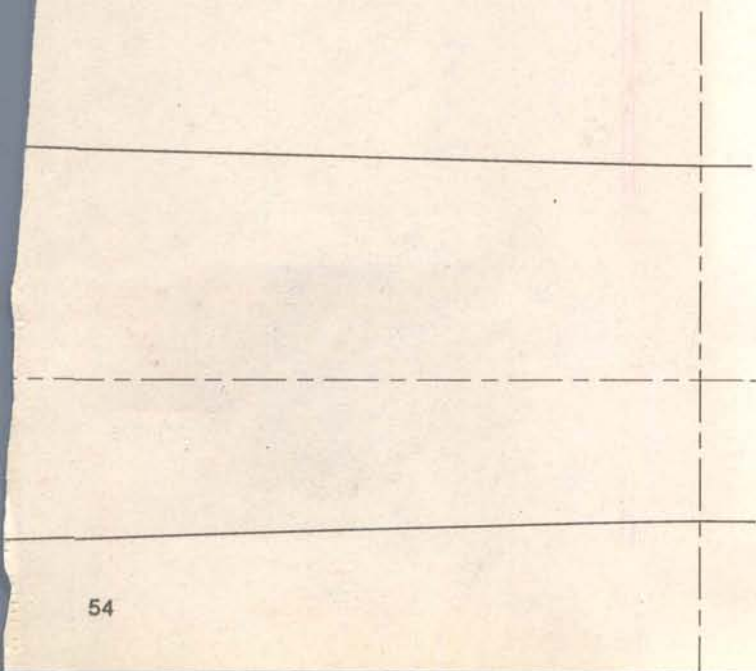
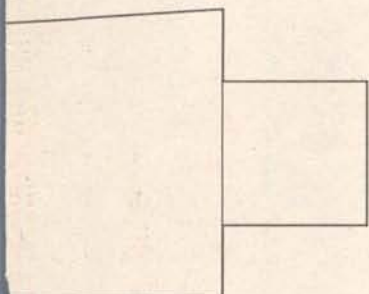
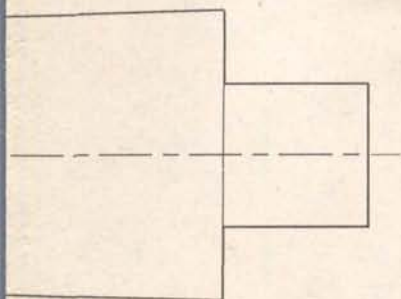


ander

Random

ler





Three Small Boats

Popular Woodworking takes to the water.



AND DID WE HAVE A BLAST!

Staff photographer Allen Shain and I built three small kayaks a year ago. Mine proved to be too small and I sold it. Allen also found he needed a larger boat. He lives in San Francisco and intends to do a lot of paddling on the Bay and the water conditions there require a true sea kayak for safety. He also needs high internal volume to store camping gear on overnight paddling trips. So the question became, "what to build?"

I called Mike O'Brien, Senior Editor at *Wooden Boat* magazine for ideas. As we talked, it became apparent that you, the readers, might like to observe the process. Since you may have different ideas as to what constitutes "fun" on the water, Mike suggested we present three boats and a couple of different construction techniques. He gave me the names of several kit makers and I got to work.

The boats presented on the following pages are true woodworking projects—as challenging as any project I've built, yet not all that difficult. Unlike that beautiful dining table I built a couple of years ago, which now sits covered with a tablecloth, when we finished these projects we got to take them out and play.

I plan to teach my girls to sail. Sailing instills discipline, awareness and an appreciation for the great outdoors.

See you on the water.

GoldenEye Hi from Pygmy Sea Kayaks.



Nimrod 12 from Stimson Marine.



Eight Ball SG from Glen-L Marine Designs.



GoldenEye Hi

by Allen Shain



The boat arrived as one 4" X 8" X 8' crate and two small boxes. The crate included all the pre-cut panels, butt-block material, coaming, adjustable foot braces, seat and back pads. The boxes contained epoxy, wood flour, fiberglass cloth, wire, the construction manual and the incidentals for working with epoxy. I also received an optional deck rigging pack of shock cord and strap eyes for rigging the fore and aft decks and a stainless clip for the paddle park—well worth the extra \$20.

Construction began in early October and I was determined to be on the water by spring. The maiden voyage was in late February.

The well-written manual is divided into reasonable working time schedules. After a short introduction and some basics about epoxy, I was butt-plateing the corresponding numbered panels together. Keeping the manual handy and planning a step ahead sometimes allowed me to do two steps in one day. By the same token, looking ahead alerts you that sequential steps occasionally need to be performed in close succession. For instance, the supplied epoxy can be reapplied within 72 hours to avoid sanding.

The manual boasts that you'll have a completed hull in less than 15 hours, and such was the case. The stitch-and-glue form is shaped around three temporary guide pieces. It's helpful to have an assistant when initially placing the panels, but the remainder of the work, threading and twisting, can be done alone. Each new panel is secured at the chine. The butt plates align to form the only internal rib in the kayak. At the very least, long needle-nose pliers help prevent wire cuts. A pair of safety wire pliers, which grip and twist the wires, is an indispensable tool.

The outside of the hull is glassed after the seams are glued and the stitches removed. Glassing the inside of the hull is a challenge—wetted cloth tends to rise off concave surfaces. The deck is formed on top of the hull, then removed to glass the underside.

The kit is well thought out and provides everything necessary to finish the kayak. But before I went to check out the wave conditions, I purchased a sea sock, spray skirt and paddle from Pygmy. The paddle in the photo is made by Sawyer Paddles & Oars in Talent, Oregon. A sea sock is a safety device that eliminates the need for bulkheads. The sea sock stretches tightly around the cockpit coaming and fits inside. If you flip over and fall out of the boat, it'll stay high and dry. The water will only get in the sock. The GoldenEye is designed to fit an optional rudder, but the design and good paddling technique makes this option unnecessary—rudders help kayaks go straight, they're not to help turn.

Pygmy Kayak offers many other kits and owner John Lockwood wrote the

Pygmy Kayak Co.
PO Box 1529P
Port Townsend, WA 98368
Tel. 206 385-6143
Catalog price \$2.00
Kit \$595.00 (\$10 less for std.)
Sea sock \$59.95
Deck rigging \$20.00
Skirt \$49.95
Paddle \$120.00
Rudder kit (see text) \$150.00
Total \$844.90 plus S&H
PW Reader Special \$760.41 plus
S&H (\$10 less for std. depth)
Other kits offered: yes
Our delivery time (CA) 5 days

software for his computer-aided designs. Even the wooden panels are cut with the aid of a computer. Clean cuts, smart design and explicit directions make for a straight forward and easy assembly.

The final outcome is a beautiful, strong boat. The GoldenEye tracks straight and handles a solid chine turn. It's difficult to say which I enjoy more: building or paddling.

Construction Photos

1. Corresponding numbered panels are joined with epoxied butt plates and weighted down with bricks.
2. The temporary panels are hot glued in place; then the hull is formed around the panels with wire stitching.
3. An epoxy bead is run along inside of the keel seam. 2 X 4 pieces along the outside of the hull keep the kayak level.
4. The exterior glass is smoothed out before it is wetted.
5. Saturated with epoxy, the cloth becomes transparent.
6. Light pressure easily cuts the glass without cutting the pre-laid masking tape.
7. The deck is taped in position with the center seams aligned. A bead of epoxy secures it.
8. Many C-clamps are necessary to hold the coaming to the deck while it cures overnight.
9. Your first experience sitting in the boat is to measure for the placement of the foot braces.
10. The finished kayak can inspire that personal touch—here native American graphic.



Nimrod 12

by Rob Cook



Building the Nimrod 12 reminded me of building model airplanes as a kid—even down to the iron-on covering.

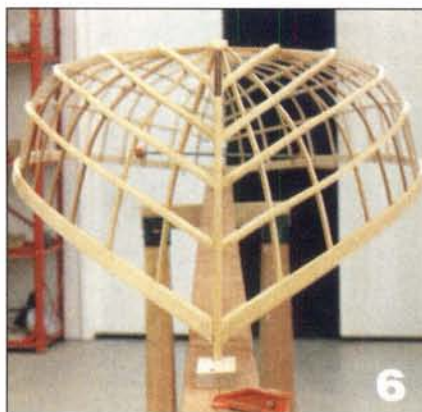
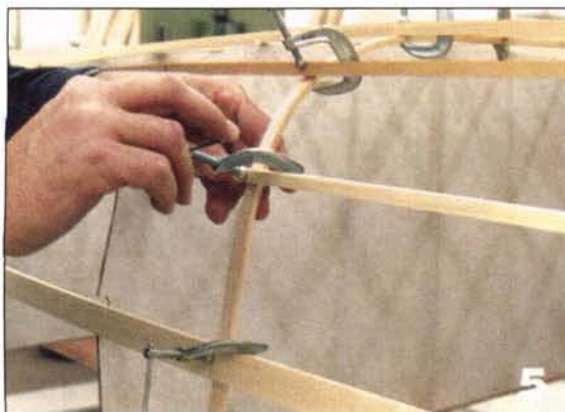
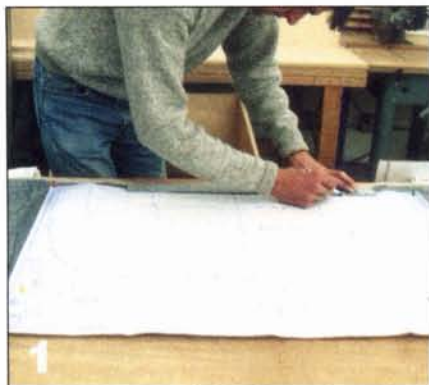
The design belongs to Platt Monfort and the kits are manufactured by Stimson Marine. Platt called me shortly after the kit had arrived to inform me that he had also produced a video on his building technique and that he was

sending me a copy. The video sells for \$19.95 ppd and is well worth it. Platt also offers a \$2.00 brochure with 17 other designs and partial kits.

All the wood parts in the kit are of excellent quality. Everything that's needed to build the canoe is included in the kit except the cardboard for the station molds and the material for the

strongback. There's plenty of epoxy and kevlar® roving, plus a couple of extra ribs in case you break one while trying to bend it into position.

All the longitudinal members are in two pieces for ease of shipping. My first step was to lay out the pieces (all neatly paired and taped together) and join them on the perfectly matched, scarfed joints.



As it turned out, someone took the plans home and forgot to bring them back. I ended up building the boat solely from the well-annotated blueprints and the video. I mentioned this to Dave Stimson and he sent me another set so I could review them. The instructions are more than complete and even provide you with plans to build your own double bladed paddle.

Building the canoe went remarkably fast. In all, it took less than 40 hours working without any real assistance. The most tedious part was applying varnish to all the ribs and stringers. I used a 1" brush and it took half a day. Next time I'll use an airbrush.

The heat-n-bond tape supplied with the kit is very effective and easy to use. I was afraid of pulling the dacron off the gunwales when I shrunk the fabric, but the adhesive has a very high shear strength.

Actually, I was a bit apprehensive about the whole covering process. Obviously, I didn't want any permanent wrinkles and I certainly didn't want to ruin the fabric and have to buy more. As it turned out, this proved to be one of the easiest tasks in the whole process. It took three hours from start to finish; including a quick review of that

section of the video.

And talk about a lightweight, all finished—varnish and all, it weighs 13 pounds, 12 ounces. Not bad for 11'6" watercraft. This boat needs an anchor on land more than it does in the water.

After all this, how does it perform? Well first, this is no white-water canoe. It's strong, but highly susceptible to broken bottles, sharp rocks and fish hooks. You may want to carry a roll of duct tape in a zip-lock bag for an emergency. For solo paddling on a calm lake or fishing a shallow slough you couldn't ask for a lighter, more stable or more maneuverable boat.



Stimson Marine
RR 1, Box 524P
Boothbay, ME 04537
Tel. 207 633-7252
Fax 207 633-6058
Catalog price \$5.00
Kit as Shown \$299.00 plus \$25 S&H
Other kits offered: yes
Our delivery time (CA) 13 days
For plans only and how-to video:
Monfort Associates
RFD 2 Box 416P
Wiscasset, ME 04578

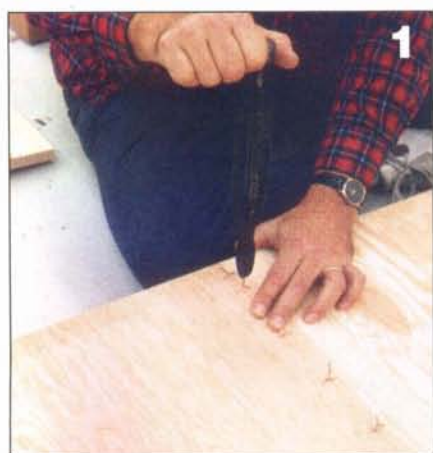
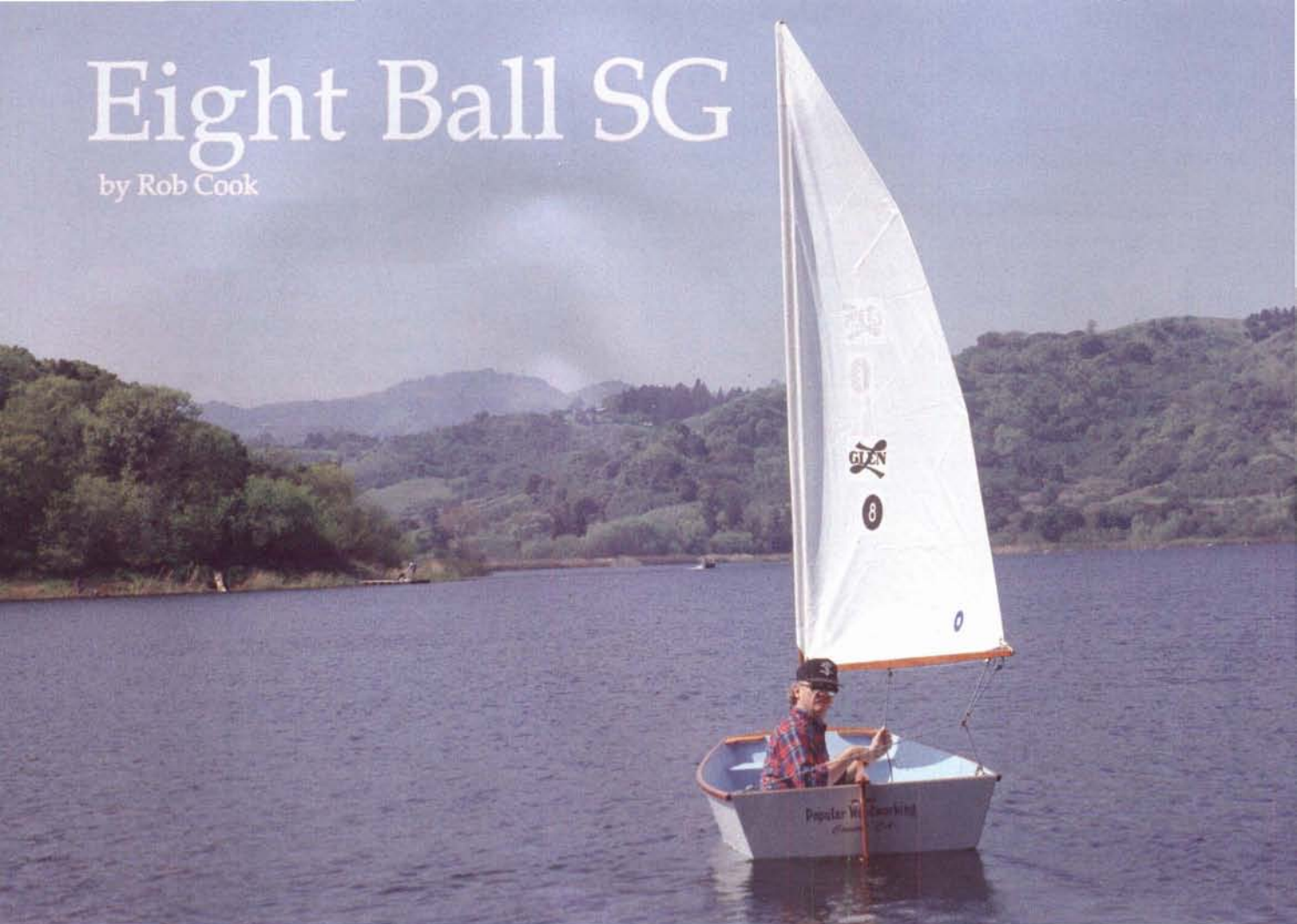
Construction Photos

1. Tracing the patterns for the station molds onto cardboard.
2. Horizontal supports are fastened to the hardback and the station molds are fastened in place.
3. With the stem cleated in place, the gunwales are positioned and epoxied in place—then the longitudinal stringers.
4. A Coleman stove and some plastic drain pipe make an excellent steam box for the ribs.
5. Freshly steamed ribs are clamped in place to dry, then set in epoxy.
6. All the stringers and ribs are bonded in place.
7. While the epoxy is curing on the inwales, the floorboards are positioned.
8. The kevlar® roving is secured in place with heat activated glue after varnishing and sanding the the wood.
9. The dacron skin is secured in place with the heat-n-bond adhesive, then the fabric is heat shrunk to remove any wrinkles.
10. The fabric is sealed with two coats of polyurethane.



Eight Ball SG

by Rob Cook



This was the first kit to arrive here at our shop and it was just like Christmas. There was one crate (1' X 2' X 8') with all the wood parts, and two small boxes that contained epoxy, fiberglass, hardware and instructions. I opened the boxes and took inventory; inspecting all the pieces. I took all the printed material home to read over and get a sense of how things would progress.

The kit does not include the parts for the mast or boom. It's a little hard to ship 13' pieces and I liked being able to choose my own wood. Glen-L suggests clear pine or spruce, but I decided on Philippine mahogany to match the rest of the trim pieces.

The instructions include: a thorough 23 page technical manual on using epoxy safely, an 11 page booklet explaining the stitch-n-glue building method, a 9 page building manual and a set of 12 drawings. Also included is a 32 page catalog of boatbuilding and marine supplies and books and videos on boatbuilding and seamanship are also available.

This design can also be built as a rowing dinghy or for use with a small motor, and that's how the plans proceed. When you need to perform a task necessary for the sailing version it's

clearly pointed out where and as it needs to be done.

My only objection with the instruction manual deals with the laminating and fastening schedules. The laminating schedule lists fillet radii and the number and size of fiberglass tapes for all the seams. The fastening schedule tells you what size screws to use and where to locate them. You have to flip back and forth through the manual as you progress instead of having the information with each step. Next time I'll copy it and put it on the wall by the epoxy.

The stitch-n-glue method of boat building is easy and makes progress to the water in quick-time. It took me about 80 hours altogether. The wood parts supplied by Glen-L are top quality. Necessary reference lines are already laid out on the parts. Except for the mast, boom, dagger board and rudder, very little cutting and shaping are needed. If you do run into problems, the helpful staff at Glen-L are only a phone call away.

Glen-L Marine
9152-P Rosecrans
Bellflower, CA 90706-2138
Tel. 310 630-6258
Fax 310 630-6280
Catalog price \$6.00
Plans and Patterns \$35.00
Construction Video \$16.95
Wood Kit* and plans \$395.55 FOB
Fiberglass and Epoxy \$167.21 FOB
Exterior Glass \$106.74 FOB
Hardware and Rigging \$68.48
Sail \$168.72
Total \$906.70 (you add paint)
PW Reader Special \$817.00 FOB
Other plans and kits offered: yes
Our delivery time (CA) 4 days
*excludes mast and boom

So how does it perform? Due to the small size, this is definitely a one-adult or two-kid boat. The day we tested the winds were very light, but the boat responded well to the slightest breeze.

Construction Photos

1. This boat can easily be built in a single car garage. The two halves of the bottom are drilled then stitched together with copper wire.
2. The bow is stitched to the bottom; then the sides are drilled, pulled up to the bottom and wired.
3. The mast is glued up with epoxy and clamped.
4. Preliminary rounding of the mast was done on the router table with a 1" diameter round over bit.
5. The mast tapers from 2" at the bottom to 1 1/2" at the top. This is an easy task with a hand plane.
6. After the seat uprights are installed, the seams are filleted and taped. The daggerboard case fits through the bottom.
7. Daggerboard case and cap installed. Seats go on next.
8. Glassing the exterior is recommended. After sanding, a second coat of epoxy seals the weave.
9. The exterior is shot with primer before finishing with catalyzed acrylic enamel.
10. The inside of the boat is painted with Zolatone®, an extremely tough combination of water and solvent based paints.



Swivel Seat Vanity Stool



by Devore O. Burch

The compact and elegant design of this vanity stool makes it a lively accent to any dressing area. Although its construction is a slight departure from the usual, it's not difficult to build.

The material sizes required for the legs and quadrants are not always available. I made the stool shown in this article by gluing up standard 4/4 white oak stock, but any good hardwood will do.

The Legs

Cut the leg blanks (A) to the dimensions given in the Cutting List. The legs are attached to the quadrants (B) with dowels. Refer to the PullOut™ Plans for their location and mark the centers on both sides of each leg. Use a 1/4" diameter bit in the drill press to drill the four 3/4" deep holes in each of the legs.

The next step is to cut the taper on both sides of each leg. Transfer the profile of the leg side from the PullOut™ Plans to your leg blanks. Cut the

tapered shape on the band saw or use a tapering jig on the table saw. Prior to shaping the front and back of the legs, layout the 1/2" x 1 1/16" rabbet on the top of each leg, as shown in the PullOut™ Plans. This rabbet receives the stretch-bar. Use a dado set in the table saw and cut the rabbet in each leg.

Refer to the leg side view in the PullOut™ Plans and transfer the profile for the front and back of each leg to your leg blanks. Cut out these shapes on the band saw. With a 1/2" diameter beading bit, rout a decorative edge on the two outside edges of each leg. Do not change this router setup because it will be used to shape the underside of the quadrants later in construction.

The Quadrants

Cut the quadrant blanks (B) as dimensioned in the Cutting List. Use the PullOut™ Plans and transfer the curved side profile from PullOut™ Plans to each of the four quadrant blanks. Cut the 45° angled corners as marked, then place dowel centers in the legs and transfer the dowel hole

locations to the quadrants. Mark each quadrant with its mating leg. With a 1/4" bit in the drill press, drill the four 3/4" deep holes in each quadrant.

After drilling all the dowel holes in each quadrant, band saw the perimeter curves. Cut the curves outside the lines then sand to the finished shape. Rout the decorative edge on the outside bottom of each quadrant. Insert 1/4" x 1 1/2" dowel pins and dry-fit the legs to the quadrants.

When the legs and quadrants match up to your satisfaction, measure the distances between opposing legs to find the true lengths of the cross braces (C), then cut the blanks. Cut a half lap in the center of each of the braces and connect them with glue and #6 X 3/4" FH woodscrew.

Pull the assembly snugly together with a band clamp. Insert the cross brace assembly into the rabbets cut in the top of the legs. Drill pilot holes at a 5° angle through the braces and into the legs. Cut out the glue blocks (D) as dimensioned in the figure to the right and drill pilot holes in each block.

Devore Burch is a frequent contributor to Popular Woodworking, from Fort Worth, TX.

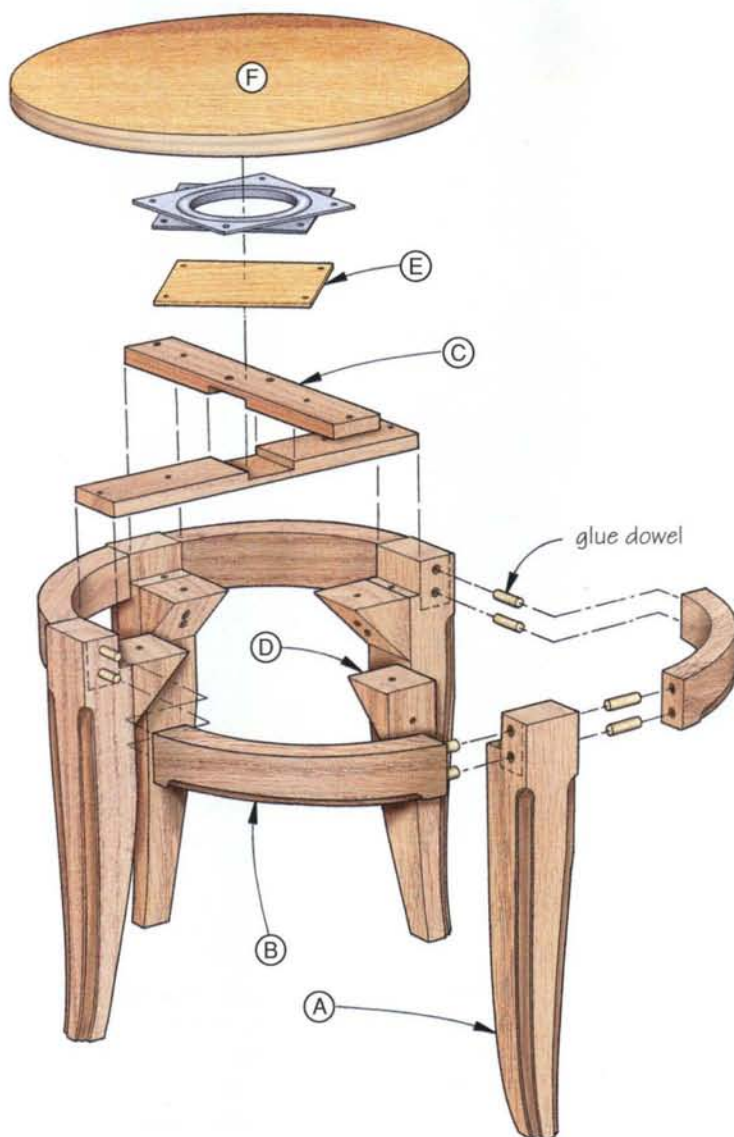
Assembly

I used a slow-cure plastic resin adhesive to give me plenty of time to assemble the stool. Use a band clamp to hold the legs and the quadrants while the glue dries. Attach the cross braces in the top of the legs with glue and #6 x 1 1/4" woodscrews. Turn the

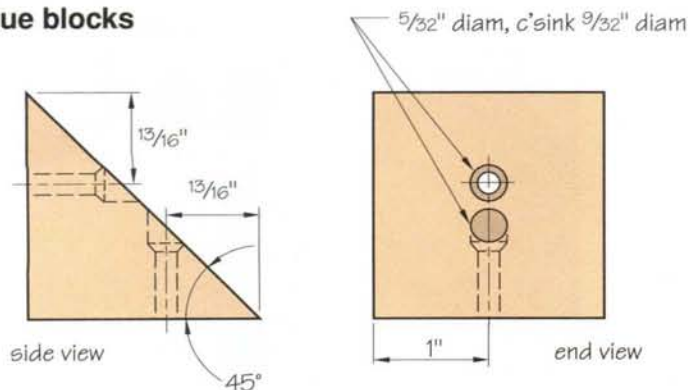
assembly upside-down and glue and screw the glue blocks in place.

Cut out the shim plate (E) as dimensioned in the Cutting List. The shim is used to form a gap between the top and lower stool assembly. Attach the shim to the center of the braces. Center the lazy susan on the shim and attach it

with screws. Make the top (F) as dimensioned in the Cutting List. Center a 6" lazy susan (available at most hardware stores) to the underside of the top and mark the screw hole locations. Line up the lazy susan marked holes in the top. Rotate the top and check to make sure it spins properly. When satisfied, drill pilot holes in the top. Prior to attaching the top to the base, finish the exposed wood parts as you prefer. I used a medium oak stain to highlight the grain, then finished with two coats of polyurethane. Upholster the seat to your taste, I took mine to a professional upholsterer. When complete, attach the seat to the lazy susan. **PW**



glue blocks



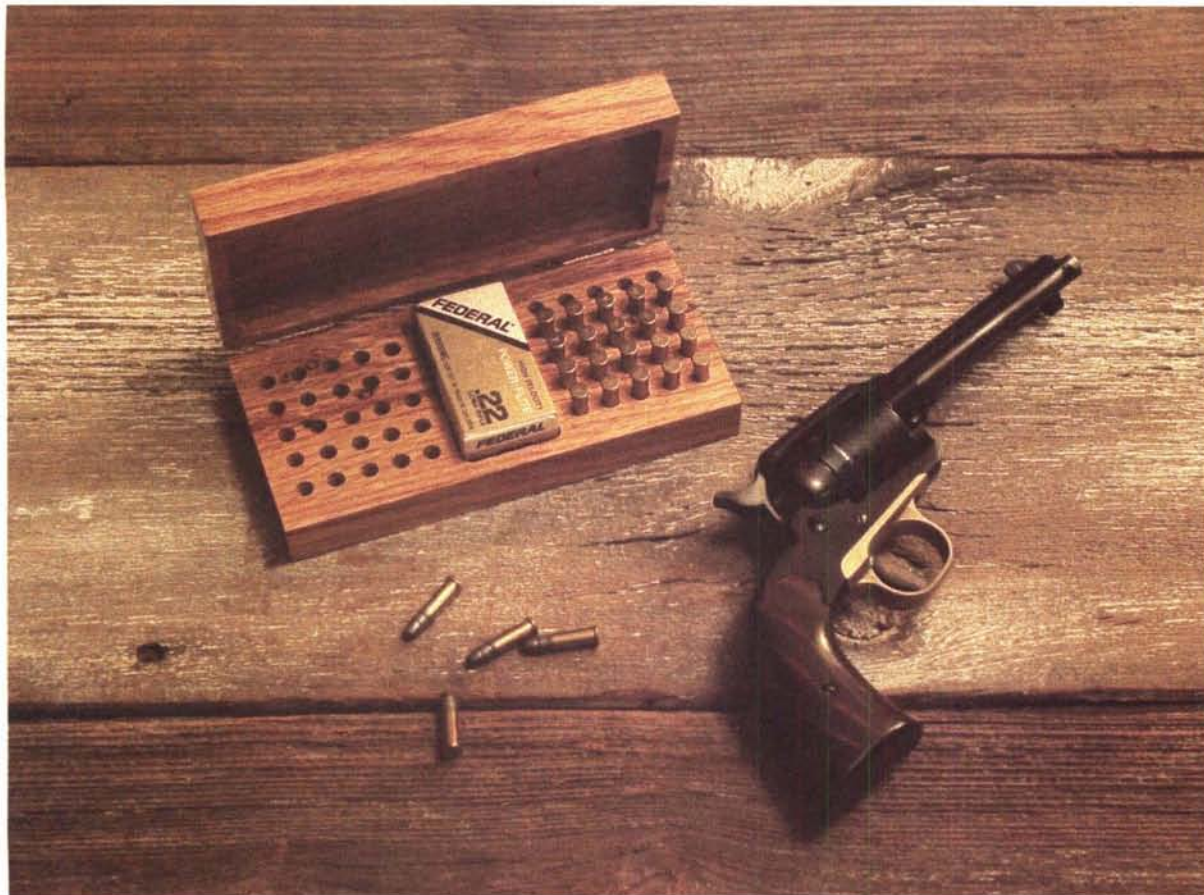
Dry assemble the base with the dowels inserted. Make any adjustments necessary.



Draw the base assembly together with a band clamp. Place the assembled cross braces on the rabbets cut in the legs.

Vanity Stool					
Cutting List					
Qty	Prt	Rough Size			Piece
		T	W	L	
4	A	2"	2"	15 3/8"	legs
4	B	2"	2 5/8"	9 5/8"	quadrants
2	C	3/4"	2"	13"	cross braces
4	D	2"	2"	2"	glue blocks
1	E	1/4"	6"	6"	shim plate
1	F	3/4"	16" diam		top

Cartridge Box



by Dana Martin Batory

Quite often a fine firearm will come with an equally fine wooden case. A custom-made cartridge box makes for a great companion piece. The cartridge box featured in this article holds one box of 50 and 50 loose rounds of .22 caliber long rifle rim fire ammo.

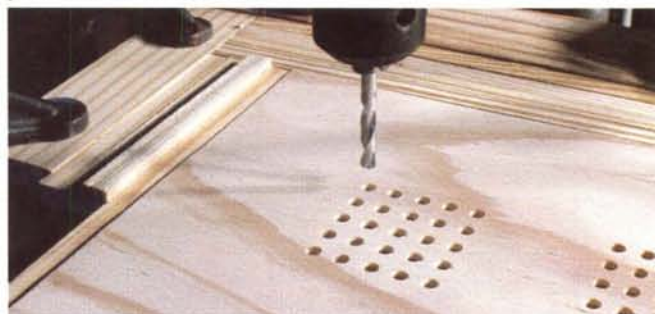
With a few simple jigs you can quickly make all the boxes you need. I had to run off a dozen boxes to satisfy everyone in my family of target shooters! One good point is that the material can be obtained from your workshop's scrapbox. Once the basic design and building method is understood, the plans are easily altered to make boxes for other sized cartridges.

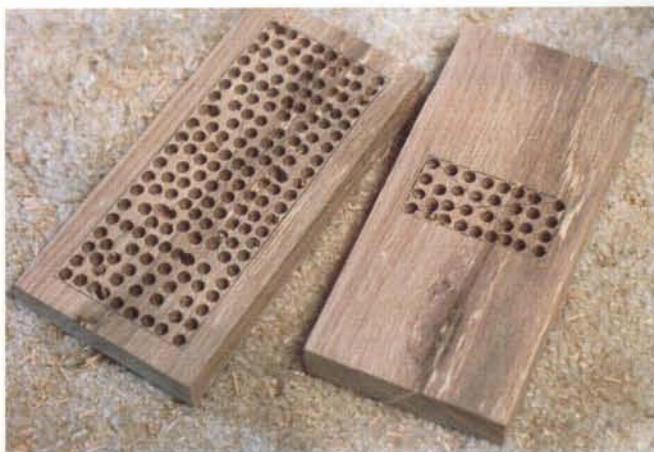
The box can be made from a solid block of hardwood stock, 1½" thick X 3" X 6", so that when the block is cut in half the grain matches. You might also want to make one from two matching or contrasting boards, ¾" thick.

Dana Martin Batory is a writer and cabinet maker and founding member of American Antique Power Tool Association.

If you foresee a high demand for these boxes I suggest you make routing and drilling templates. The routing templates are used to clear the wood in the base for the ammo box and to relieve the underside of the lid. I designed a router jig for use with my Porter-Cable Model 691 router which has a base 5¾" in diameter. Base plates can differ,

Make a drilling template to speed repetitive operations if you plan to construct several boxes.





Layout the indentations in the base and lid then drill out most of the waste.



Finish the indentations with a straight bit in the router. Use a template and make several passes.

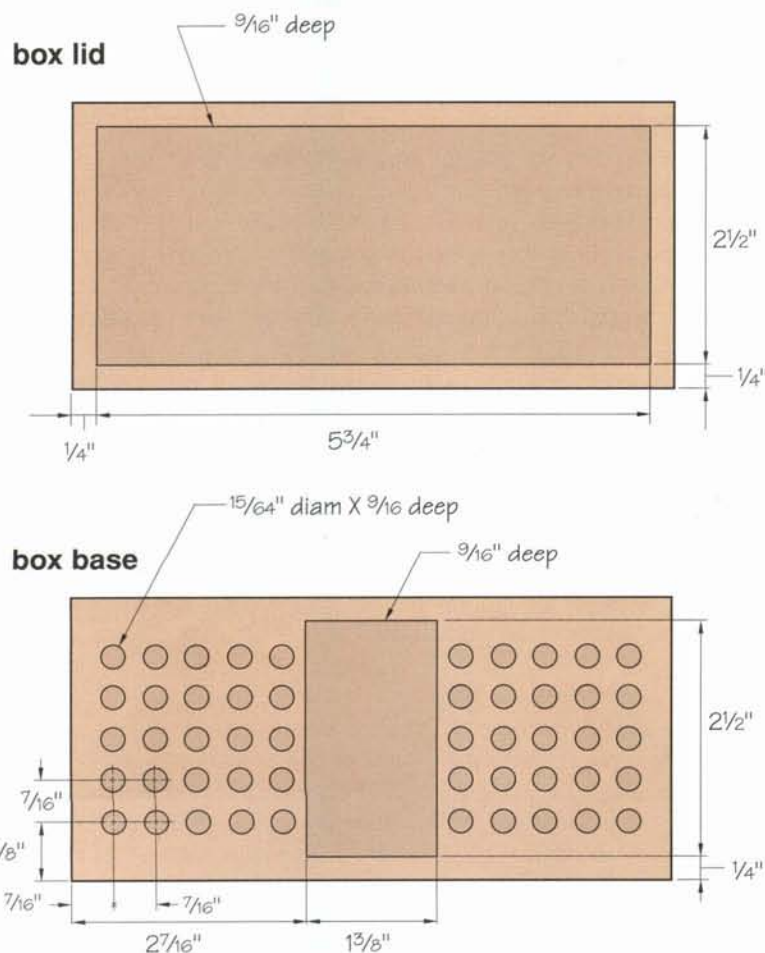
so double check before beginning jig construction. Cut the jig parts to the appropriate length and width as determined by the dimensions of your particular router. I drilled a $\frac{3}{4}$ " hole in the center of the sub-base. This makes removing the blocks easier.

I use an old pattern maker's trick to make the drilling template. Saw out eight spacers $\frac{7}{16}$ " square—four about 5" long and four about 9" long. Drill the bottom right hand corner hole of the template for indexing, as dimensioned in the figure below. Use this to position and clamp a fence and a stop to

the drill press table. When positioned properly the template will fit into the angle created and the drill bit will be poised directly above the hole. Slip in one short spacer between the right hand side of the fixture and the template and drill a hole, slip in another spacer, and drill. Continue until one row is completed. Remove the short spacers and place one long spacer along the bottom. Drill a hole. Begin adding the short spacers as before and drill. By adding the short and long spacers in sequence the holes are continually brought into the correct drilling position. When one side is completed, rotate the template and repeat the procedure. This same procedure can be used to drill the holes directly into the base, if you are not making many of the boxes.

Cut the cartridge box blank to size and saw it in half. Layout the location of the recesses in the top and bottom. To save time and wear and tear on the router, bore out the majority of the waste with a $\frac{1}{4}$ " bit in the drill press to a depth of $\frac{1}{2}$ ". Rough out all but $\frac{1}{8}$ " of the wood. Install a $\frac{1}{4}$ " straight bit into the router and adjust the bit for a $\frac{9}{16}$ " depth of cut. Clamp your router jig down securely to the workbench and insert the lid blank into the jig. Lower the router into the recess. Lift it slightly away from the wood, turn it on, and slowly lower it again. Work the router back and forth between the jig bumpers until all the wood is removed. Use the same jig to route the base. Place one spacer on each end to shorten the cutting area. Route out the cavity as before. Before removing the jig make sure the lid will clear the box of ammunition. Route the cavity slightly deeper if necessary.

Remove the spacers and put on the drilling template. Install a $\frac{15}{64}$ " bit in the drill press and adjust for $\frac{9}{16}$ " depth then drill the ammo holes. Sand and varnish. The edges can be slightly dulled with a sanding block or customized further with various shaped router bits or chamfered on the tablesaw. With a chisel, cut out the mortises for the hinges and install them, then head to the firing range. **PW**



Chip Carving



by Jack Ekstrom

Chip carving is one of the most ancient and popular forms of carving. It's easy and fun, and you can produce a masterful work of art on your first try. To make a chip carving, all you have to do is carve a series of two, three, and four-sided cuts, or chips, to complete a design.

A beautiful project for your first try is the two-headed eagle by well-known, Indiana chip carver Al Schmutz. In 1978, Al published his popular booklet with the National Carvers Museum, "Lettering and Chip Carving", which introduced many carvers to the art. He has a large collection of original chip patterns which he makes available to people for just \$2 each.

Traditional chip designs are made up of triangles with straight edges. This project is a modern chip design, in which all the cuts are graceful curves. The two-headed eagle is topical, it's the national symbol of reborn Russia. It's an easy design to carve; each half mirrors the other and it gives you the chance to make the same cuts in two different directions. It also provides an ideal introduction to carving letters.

Jack Ekstrom is a writer and illustrator from Colorado and the former editor of The Mallet, the journal of the National Carvers Museum.

Wood Selection

Nearly all the cuts are graceful curves. Choose a wood with an even, straight grain so your knife won't go in unwanted directions. While soft white pine is suitable, do yourself a favor and invest in a 1" X 8" plank of basswood, butternut or any soft hardwood that you'll enjoy looking at on your wall. Use a light colored wood to show off the shadows of your cuts. Carve under sunlight or light bulbs, not fluorescent light—it destroys the shadows.

Cut your wood to 8" X 8½". Prepare two pieces so you can make the first piece a practice one if necessary. Bevel the top edge ¼" at a 45° angle. Sand your carving surface through 320-grit sandpaper. Bear in mind that the fine grits of sand that remain on the wood from your sandpaper will dull your knife blade. After sanding, brush and rub the wood thoroughly to clean it.

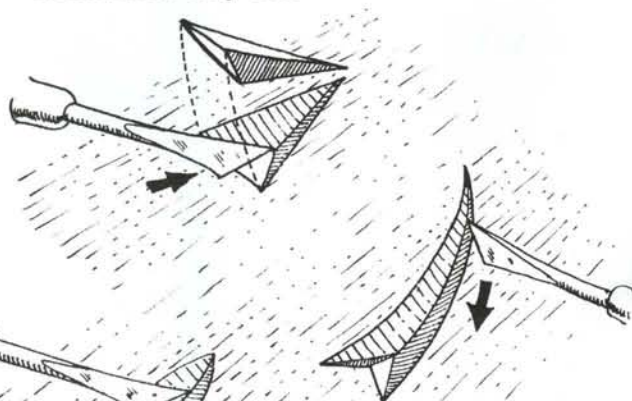
Tape the pattern over a piece of carbon paper and transfer it onto your stock. Fold the paper around the back of the wood so you can trace the pattern again if it rubs off as you carve.

Tools

Al mainly uses pull knives for chip carving. These are unique carving tools that were developed by the old German master carvers. Marples makes an excellent pull knife; Al shaped the handle on his like the shape preferred by the old masters and keeps a cork on the sharp tip. You have a lot of control with a pull knife, which is among the safest of carving tools as long as you remember to keep your other hand behind the blade.

I've found the best tools for chip carving are the new "Into" series of knives from Warren Tool Co., Inc. They're made from high quality carbon

traditional chip cut



curved chip cut



curved V cut

steel and are honed razor sharp on one side of the blade and ready for immediate use.

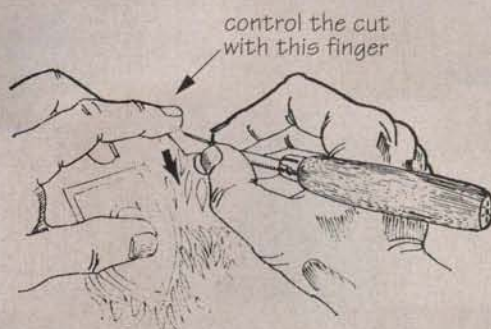
Eastern craftsmen, who first developed these knives, were the original masters of chip carving. They used these pointed knives to carve their famous wood blocks used for printing. Excellent, high-quality, Japanese laminated steel blades, Kiridashi Kogatana, are available in three styles: right bevel, left bevel and double bevel, in flat shanks which fit in interchangeable handles. You'll also need a stylus or awl to burnish and dress the finished chip cut.

Usually you use a bench stop in relief carving. Since many of your cuts are pulled or drawn toward you, instead of pushed away from you, you can use a good, non-slip router pad. The pad prevents the wood from moving as you apply lateral force; and you can hold the wood safely with your other hand, which you wouldn't dare do if you were pushing the tools.

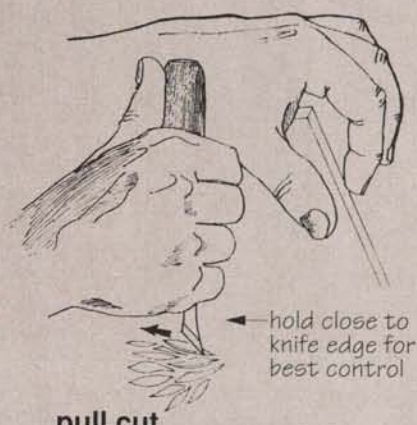
Carving

The traditional chip cut is a three-sided, straight-edged cut which produces the chip. All three cuts meet cleanly at the bottom of the triangular-shaped cut. The chip cuts in the two-headed eagle are all graceful curves, but they're made in the same way as the traditional chip cut.

Start carving on the small, inside wing feathers to give you practice with your tools before you attempt the larger wing and tail feathers. Many of the smaller feathers are not chip cuts at all, but are simple V cuts—two-sided cuts shaped like the letter V. Each V cut is made with two angled draw or pull-cuts.



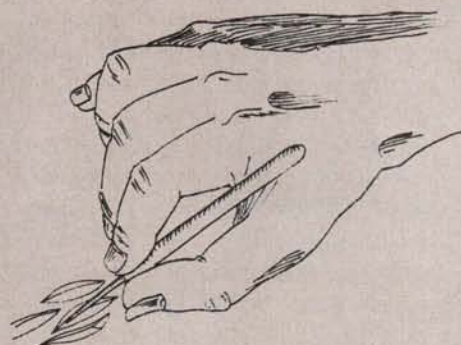
two-handed draw cut



pull cut



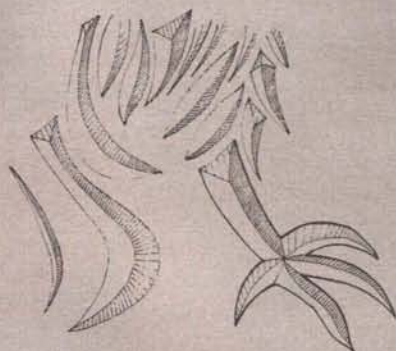
guiding the pull cut



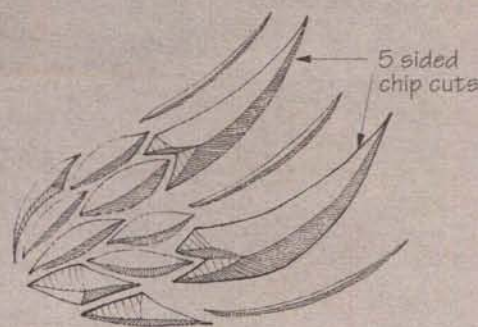
dressing the chip cuts



the eagle heads



leg and tail details



large feather detail

To draw-cut, hold each knife as you would a pencil and draw it carefully toward you. You can exercise a great deal of control by directing the draw-cut with the forefinger of your other hand. Holding the knife very close to its edge also gives you good control of the tool, whether draw or pull-cutting.

To pull-cut, grip the knife with your four fingers so the blade is pointed downward from your fist and put your thumb on the end of the handle. Control it by pulling it mainly with your little finger and pushing with your thumb, turning your wrist as you cut.

Make the first cut of the small feathers at a 30° angle. Keep the beveled edge on the downward side. The purpose of the bevel is to provide a fulcrum which helps free the wood. Make the second cut at a 30° angle to the first one so they will meet in the wood. Go only about 1/16" deep at a time. Deeper V cuts need several draw or pull-cuts on each side. Making the second cut with the other knife saves you from having to turn the wood around.

Both cuts should be gracefully curved and meet cleanly at the bottom of the V—the resulting chip should come out cleanly. If it doesn't, make the cuts over again until they meet at a depth of about 1/8". Remember that the points of the blades are *very fragile*; never pry with them. If they break, you have to regrind and hone them.

As you carve the smaller feathers, especially along the necks and legs, you'll begin making

three-sided chip cuts so the feathers all fit together, with about the same 1/16" space between them.

Make the first cut with one blade, and the last two with the other blade. The third cut is the one that releases the chip. All three cuts should have three sharp lines defining them and meet in a single point. Use the pull-cut for the third cut especially, guiding it carefully with the thumb on your other hand.

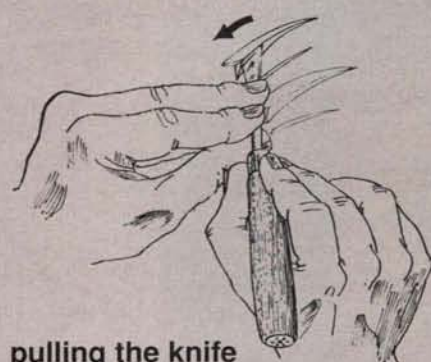
Don't worry about following the pattern exactly. Often the grain of the wood determines the size of your cuts. You'll find yourself being able to put graceful curves on the ends of your cuts that aren't in the original pattern. A larger chip cut can often correct an error in a small cut.

The heads are distinguished by having the finest, most graceful cuts. The tongues, eyebrows and tops of the heads are very fine V cuts, made with the tip of your knives. The eyes are perfect, shallow, chip cuts. The upper and lower beaks are carefully shaped chip cuts. The feathers on the back of the heads have especially flowing tips, as though they're blowing in the wind. The long, curved cut that connects the two heads is a six-sided chip cut.

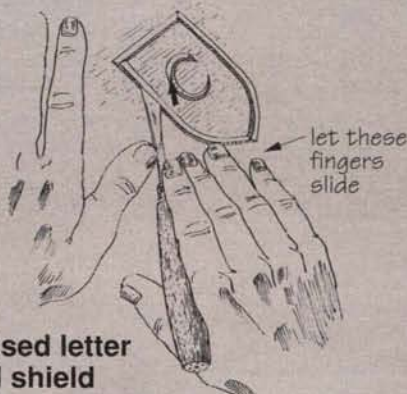
The legs are the deepest chip cuts so far; they should appear strong. And like the beaks, the talons are carefully shaped chip cuts, only deeper. The five chip cuts of each leg and foot meet in one clearly-defined, deep point.

The five large feathers on the tail are more curved than any of the other feathers. Only a couple of them are chip cuts. The large one in the center is a straight, very deep V cut. The other two are deeply curved V cuts.

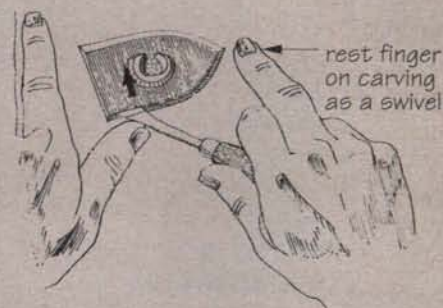
The large wing feathers are the most fun to carve, and except for the letter and shield, are the highlight of the carving. There are seven long, 1/4" deep feathers, separated by seven shallow V cuts that are over 1" long. Carefully draw each feather before carving it; how they fit with the smaller feathers is important to your design. Make sure the feathers on both wings are symmetrical. The bottom of some of the feathers may have several chip-cuts.



**pulling the knife
with your other hand**



**incised letter
and shield**



relief letter and shield

Don't worry about getting these large chips out in one piece. Start at the shallow, tip end and remove the chip a little at a time, working deeper and deeper as you go. Using both your hands to carve is not only the safest method, but always gives you the most control. You can make the deep, graceful cuts on the feathers by holding the knife with one hand and actually pulling the shank with your other hand.

You have a choice of two different ways of carving the shield and letter: incised carving or relief carving.

Incised carving is the simplest way to carve letters. It's basically just V cutting. The outline of the shield is a long V cut, $\frac{1}{8}$ " deep. Make it as straight and symmetrical as possible. The letter, which you can change by copying other letters out of magazines, is carved the same as the shield, with deep, graceful V cuts. Clean and straighten the bottom edge of the shield by holding the tool with one hand, exposing the entire length of the shank, and push it forward with the thumb on your other hand, letting the fingers on your carving hand slide over the wood. Very seldom will you push these knives, but when you do be sure to use both hands.

Relief carving is the opposite of incised carving; the letter is left high and all the wood around it is removed. V cut the shield $\frac{1}{8}$ " deep as you did for incising, but don't worry about making the inside edge straight. Then V cut around only the outside of the letter $\frac{1}{8}$ " deep. Finally, remove all the wood between the edge of the shield and the outside edge of the letter using two-handed thumb push cuts.

The two-handed thumb push cut is safe since you use both hands. Push cuts are usually the most dangerous cuts if made one-handed, as in chiseling. To remove large amounts of wood in relief carving, hold the tool handle close to the wood and push slowly and easily, about $\frac{1}{16}$ " into the wood at a time. The tip of the blade leads and is an especially good cut when going across the grain.

A second variation of the two-handed thumb push cut is done when one finger of the carving hand rests on the wood and acts as a swivel while the thumb on the other hand pushes behind the edge of the tool.

The entire knife edge cuts squarely; this is good when going with the grain. Make the edges of the shield and letter sharp with this cut.

Finishing

When you have finished cutting and cleaning, sand the wood again, making sure all the edges of the chip cuts are clean. Varnish or stain in a manner you like. Attach a light chain on the top edge with two small wood screws, and hang your chip carving where everyone will see it. Be sure to put your name on the back, and the date you finished it. **PW**

Sources

For original chip carving patterns:

Al Schmutz
Designs in Wood
1423 Melbourne Dr.
New Haven, IN 46774

For "Into" knives and tool catalog:
Warren Tool Co., Inc.
2209-1 Rt. 9G
Rhinebeck, NY 12572

Kiribati Kogatana knives and catalog:
The Japan Woodworker
1731 Clement Ave.
Alameda, CA 94501
510 521-1810



Inverted Orbital Pad Sander

by Dick Dorn

I clamped an old orbital sander upside-down inside a small wooden box, more than doubled the surface of the sanding pad, and now have a unique benchtop sander which is handy, useful, and ideally suited for smaller sanding operations.

My oldest orbital sander, a twenty five year old Rockwell model 505, was accidentally dropped on the concrete floor and the handle was damaged beyond repair. Over the years I had become attached to the sander and I kept it in excellent condition by replacing bearings, brushes, and sanding pads as they were needed. I even replaced the switch and cord a few times. I was always impressed with the speed, smoothness, and balance of the model 505 orbital sander. So, as our inventory of orbital sanders expanded, I continued to buy the same reliable model, now PorterCable #80.

I placed the damaged sander on my workbench so I could salvage the usable parts. But, I hesitated to throw it in the spare parts bin. Instead, I tinkered, made sketches, and finally began to visualize my sander inside a small, rectangular box which I call an inverted orbital pad sander. The adjustments necessary to convert the sander were made, the required materials were located, and within a week my old sander was again operational.

Dick Dorn is a contributing editor to Popular Woodworking. He teaches high school shop in Oelwein, Iowa.

Converting the Sander

Remove the top cap from the sander to expose the electrical wires, switch, and cord connections. If the cord is in good condition use it on the rebuilt sander. Remove the wire nuts and switch to free the two wires which lead to the motor. Temporarily tuck the two wires inside the motor housing so they can't be damaged as the handles are cut from the motor housing. Remove both sander handles to simplify the installation of the motor housing in the confined interior of the wooden box. Cut the handles off with a hacksaw as near to the motor housing as possible. Glue a piece of 1/4" thick rubber over the hole that is exposed when the rear handle is removed. Pierce the rubber shield with a punch and feed the two wires back through the rubber so they are stabilized. The hole that is exposed when the front handle is removed is an air intake vent that should not be covered. The motor depends on a constant cool air supply for efficient operation.

Remove the felt pad on the metal back-up plate along with the sandpaper clamps, springs, and rivets located at each end of the pad holder. The clamps aren't needed because the sander will use adhesive-backed, pressure sensitive sandpaper on the enlarged sanding pad. Keep all the parts that were removed from the lower section of the sander. The new, enlarged sanding pad should weigh close to the combined weight of the removed parts to maintain the

balance of the sander. At 10,000 orbits per minute, a high quality orbital sander must be balanced to run smoothly without vibration.

Blow the dust out of the sander, tighten screws, and check the ball bearings and brushes. Inspect the rubber coupling that drives the counterweight and the rubber pad posts located on each corner of the pad holder. Replace damaged or highly worn parts.

Plywood Housing

The housing presented here was designed to accept my inverted Rockwell 505 sander. The outside dimensions of the housing are 9" X 11" so the new sanding pad will accept a full sheet of sandpaper. The total outside height of the housing was dictated by the space needed for the sander. When the sander is properly installed in the housing there is a clearance of 1/2" between the top rim of the housing and the underside of the attached sanding pad.

Cut the housing sides (A), ends (B) and bottom (C) from 3/4" plywood to the dimensions given in the Cutting List. Cut three 3/4" X 3/8" deep rabbets in each side and one in each end as located in the side, end and top views. Dry assemble the housing and check for a tight square fit. The exterior of the housing will be covered with a plastic laminate, so all the surfaces need to be perfectly flat, the joints flush, and the corners square.

Before assembling the housing, a recessed pocket must be drilled for the toggle switch. The barrel of most switches isn't long enough to reach through 3/4" plywood and plastic laminate. Bore a 2" diameter X 1/2" deep hole in the inside face of one of the ends as located in the side and end views.

Assemble the housing with glue and 8d nails. Prepare the outside surfaces and the bottom and top rim for plastic laminate by filing, sanding, and setting the nails below the surface. Cut and attach plastic laminate veneer with contact cement, sanding each piece flush with the housing edges as you go.

Sander Clamp

The sander must be securely locked within the housing. Build a wooden clamp to hold the sander in place. One of the matching halves of the clamp is glued and screwed to the inside walls of the housing while the other is free to move laterally. Two 5/16" diameter X 5" carriage bolts are used to draw the two halves together around the sander. The entire clamp must be built and pre-assembled before it is positioned in the housing. The interior of the housing will be crowded, so it is impossible to insert the long bolts after the clamp is installed.

Cut the stationary clamp (D) and the movable clamp (E) to the dimensions given in the Cutting List. Layout and drill two 5/16" holes in the stationary clamp and two 3/8" holes in the movable clamp as located in the top view. Transfer the profile of each clamp from the PullOut™ Plans and cut with the band saw. Use five minute epoxy to glue 1/4" rubber to the inside of both semi-circular edges as shown in the top view. Assemble the clamp with the carriage bolts and test the fit on your sander inside the sander housing.

The stationary clamp must be glued and screwed in the housing so it is level and at a precise height. As an aid, I cut six legs exactly 3 5/8" long to stand vertically on the bottom of

the housing. When the clamp is lowered into the housing it can come to a rest on the legs at the correct height. Remember that only one side of the clamp is glued in place. After the glue has cured, drill, countersink, and insert five #8 X 1 1/2" FH wood screws through the housing into the clamp. Although most of the leg supports may be removed, I glued two of them permanently at each end of the movable half of the clamp so they can absorb downward pressure of the sander.

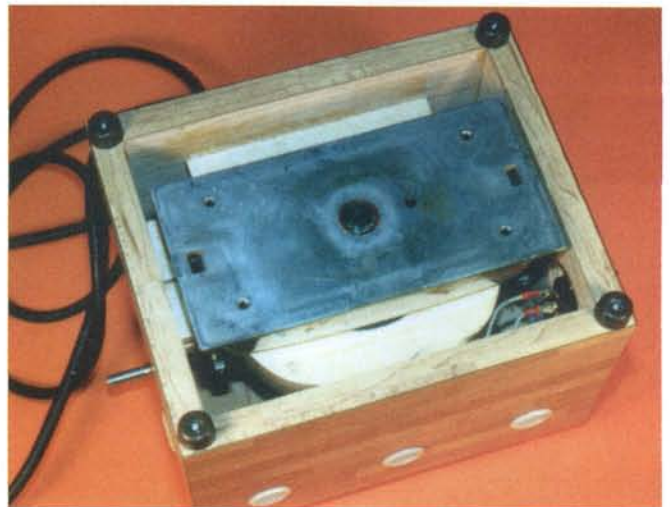
Drilling the Sander Housing

Use a spade bit in the drill press to bore three 1" diameter holes in each side and one in each end as located in the side and end views. These holes will act as air intake vents for the sander. I used louvers designed for house siding to cover the vents. Lightly tap the louvers in place with a block of wood under your hammer. Cool air circulation is extremely important for the sander motor.

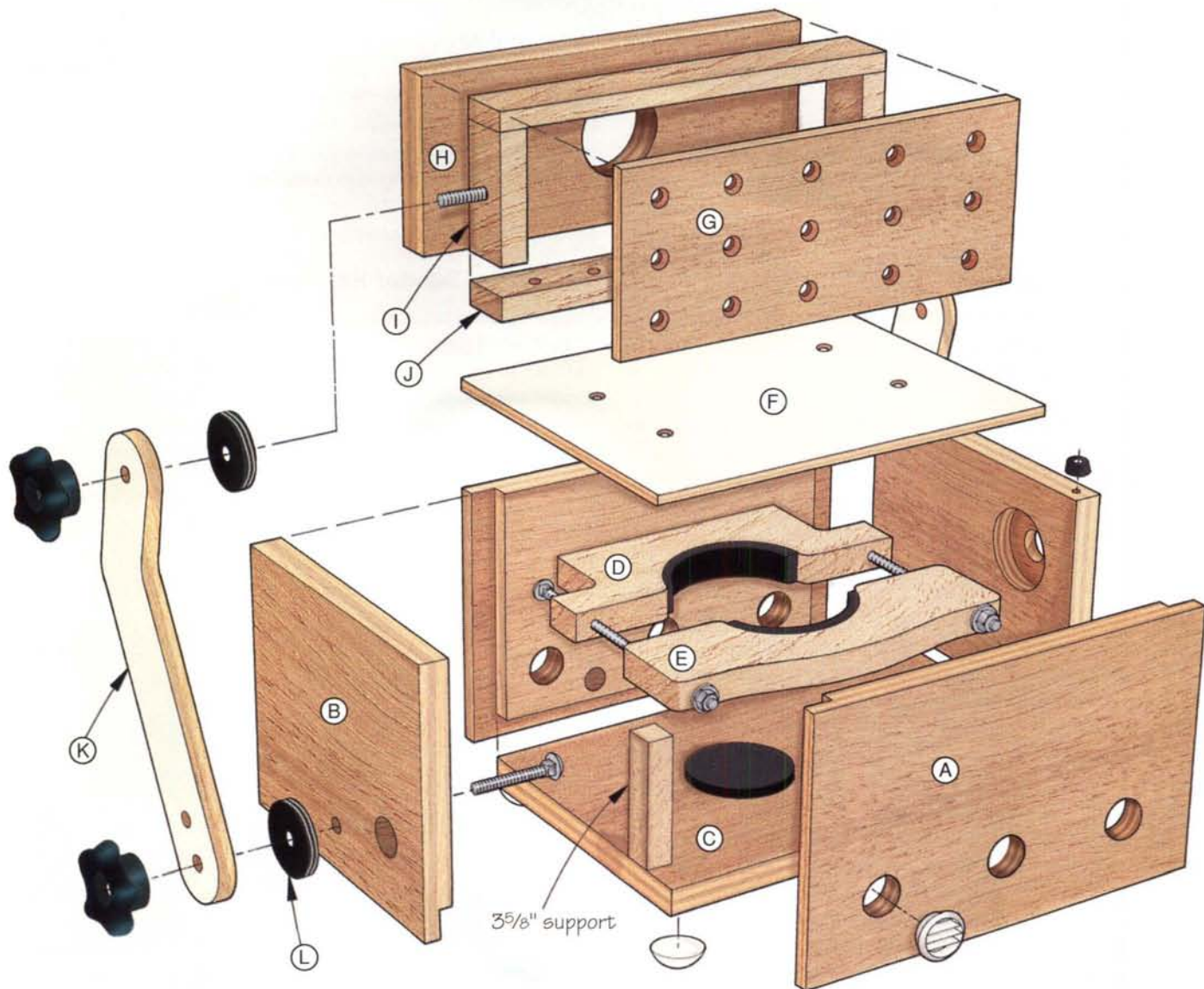
Drill a 3/8" diameter hole as located in the side view in each housing end to receive 3/8" diameter X 2" carriage bolts. The bolts will eventually carry spacers, arms and knobs for the vacuum fence. Again, use your drill press so the holes



The disassembled Rockwell 505 sander; ready for wiring, modification and installation.



The sander housing with the Rockwell 505 sander installed in the clamps.



Inverted Orbital Pad Sander					
Cutting List					
Qty	Prt	Finished Size			Piece
		T	W	L	
2	A	3/4"	7"	11"	housing sides
2	B	3/4"	7"	8 1/4"	housing ends
1	C	3/4"	8 1/4"	10 1/4"	housing bottom
1	D	1"	3 1/2"	9 1/2"	fixed clamp
1	E	1"	3"	9 1/2"	movable clamp
1	F	1/4"	9 1/8"	11 1/8"	sanding pad
1	G	1/4"	4 1/4"	11"	fence front
1	H	3/4"	4 1/4"	11"	fence back
2	I	3/4"	1 1/2"	3 1/4"	fence ends
2	J	1/2"	1 1/2"	11"	fence top & bottom
2	K	3/8"	3 5/8"	12 1/4"	arms
4	L	1/4"	1 7/8" diam		spacers

Hardware	
1	1/4" X 1/2 sq. ft. rubber
1	4 sq. ft. plastic laminate
2	5/16" diam X 5" carriage bolts, nuts and washers
5	#8 X 1 1/2" FH wood screws
8	1" plastic louvers ¹
2	3/8" diam. X 2" carriage bolts, nuts and washers
1	5/8" OD plastic caster socket ²
4	7/8" diam X 1 1/2" plastic bumpers ³
4	Softstop door stops ⁴
2	3/8" diam X 2" threaded rods
4	5 star 3/8" thru hole knobs ⁵

1 Shur-line, Inc. (available at your local hardware store)

2 Faultless Caster Corp. (available at your local hardware store)

3 Brainard Mfg. Co., Tel. 716 586-0028

4 National Mfg. Co., Tel. 800 253-5243

5 The Woodworkers' Store, Tel. 800 279-4441

will be straight. Insert the bolts in the holes from inside the housing. Apply a liberal coat of five minute epoxy under the head and over the upper 1/2" of the bolt, and pull it in place with washers and a nut until the epoxy has cured.

Drill a 5/8" diameter hole for the cord in the back housing side as located in the side view. I lined the hole with a 5/8" OD plastic caster socket. After the caster socket is tapped in place ream the hole to fit the diameter of your cord. Taper the opening with a countersink bit to reduce cord wear.

Complete the hole for the switch. Locate the switch hole center on the outside of the box and use a 7/16" spade bit to drill the hole from outside the housing so the plastic laminate isn't chipped.

Installing the Sander

Before the sander is inserted upside down into the housing, a few wiring jobs need to be accomplished. Again, you will be working in a very confined space. The wires from the sander need to be lengthened about 10" so they will reach above the rim of the housing. Use the same gauge wire as the cord and attach the extensions with butt connectors or wire nuts. Be sure to attach a ground wire to the sander so it too can be reached easily. Insert the cord into the housing and determine the length needed to match the length of the wires from the motor. I placed a small plastic tie tightly around the cord so it couldn't be pulled back out of the housing. One wire from the cord and one wire from the motor should be connected with a wire nut. The other two wires, one from the cord and one from the motor, meet at the two terminals of the single pole toggle switch. I connected them to the switch with spade type connectors. Connect the two ground wires with a wire nut and the job is completed.

As I connected the wires, my sander was balanced on top of the housing and the switch was not inserted in the recess. Insert the switch and lower the sander into the opened sander clamp. Keep the wires free and organized and turn the sander so the bottom plate or pad holder is parallel with the walls of the housing. The top of the sander should rest on 1/2" X 7/8" diameter plastic bumpers epoxied to the housing bottom. The sander should seat nicely in the sander clamp. Tighten the clamp around the sander with the two carriage bolts and nuts that have been installed previously. The bottom of the sander will extend above the rim of the housing about 1/2" and it should be level.

Laminating the Sanding Pad

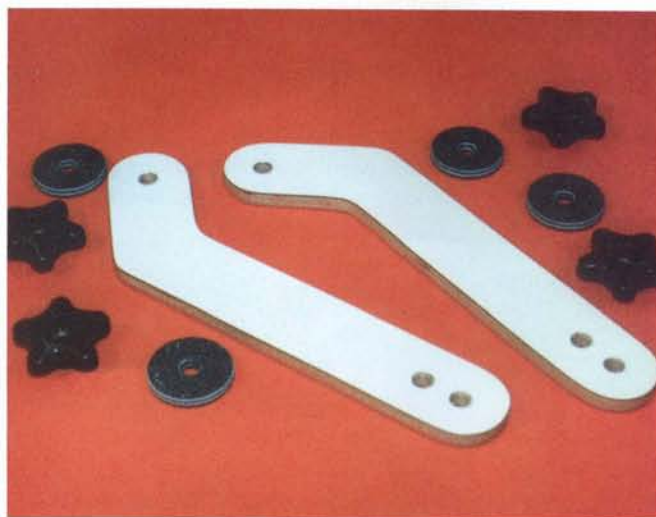
The new sanding pad is easy to build since it is perfectly flat and unobstructed. Attach two pieces of plastic laminate on each side of the hardwood plywood sanding pad (F) as dimensioned in the Cutting List. Make accurate layout lines and determine where the holes need to be drilled in the sanding pad in relation to the holes on your sander for the four pad screws. The old pad and metal back-up plate are helpful guides in this process.

Drill and countersink holes through the top of the sanding pad so the screw heads which hold it in place will be slightly below the surface of the pad. Use flat head machine screws which correspond to the dimensions of the holes on your sander's pad holder to attach the sanding pad. Recess the

center of the underside of the sanding pad to accept the counterweight, washer and screw, which project above the surface of the pad holder. Temporarily screw the sanding pad to the sander and give the sander a short test run.

The pad holder is held on the sander by four rubber pad posts and a rubber coupling. They are flexible so the pad can oscillate and tilt from side to side. To eliminate excessive tilt and keep the new sanding pad level while sanding, place plastic bumpers on the top rim of the housing at each corner as stabilizers. The bumpers should not rub the underside of the sanding pad unless the pad is forced downward. There should be a clearance of about 1/16". While the pad is on the sander you should check the bumper clearance and make adjustments of the bumpers with your disc sander. Remove the sanding pad and screw the bumpers in place.

The sanding pad should be glued and screwed to the surface of the pad holder. Don't glue the entire surface. Use sole repair rubber adhesive in scattered spots and screw the pad to the pad holder. It must cure overnight. If the sander should need repair at any time the rubber may be pried loose.



The arms, spacers and five star knobs ready for assembly. The arms are covered with plastic laminate; the spacers with anti-skid tape.



The hole in the back of the vacuum fence should be cut to fit your shop vacuum.

Feet and Sandpaper

The white plastic hemispherical feet are designed to be placed on walls as door knob stops. They have air cushioned action and peel off adhesive backing. Place them as far apart as possible on the four corners of the bottom.

The laminated sanding pad is designed to take advantage of adhesive-backed pressure-sensitive sandpaper by 3M. It is sold in rolls and may be cut to length. Quite often I use regular 9" x 11" sandpaper fastened to the sanding pad with a few pieces of double-faced carpet tape.

The sanding unit is now complete. When sanding, hold your work firmly with light downward pressure, and let the sander do the work. In a few minutes you will adjust to the feel and learn to resist the orbital motion of the pad as you sand.

The Vacuum Fence

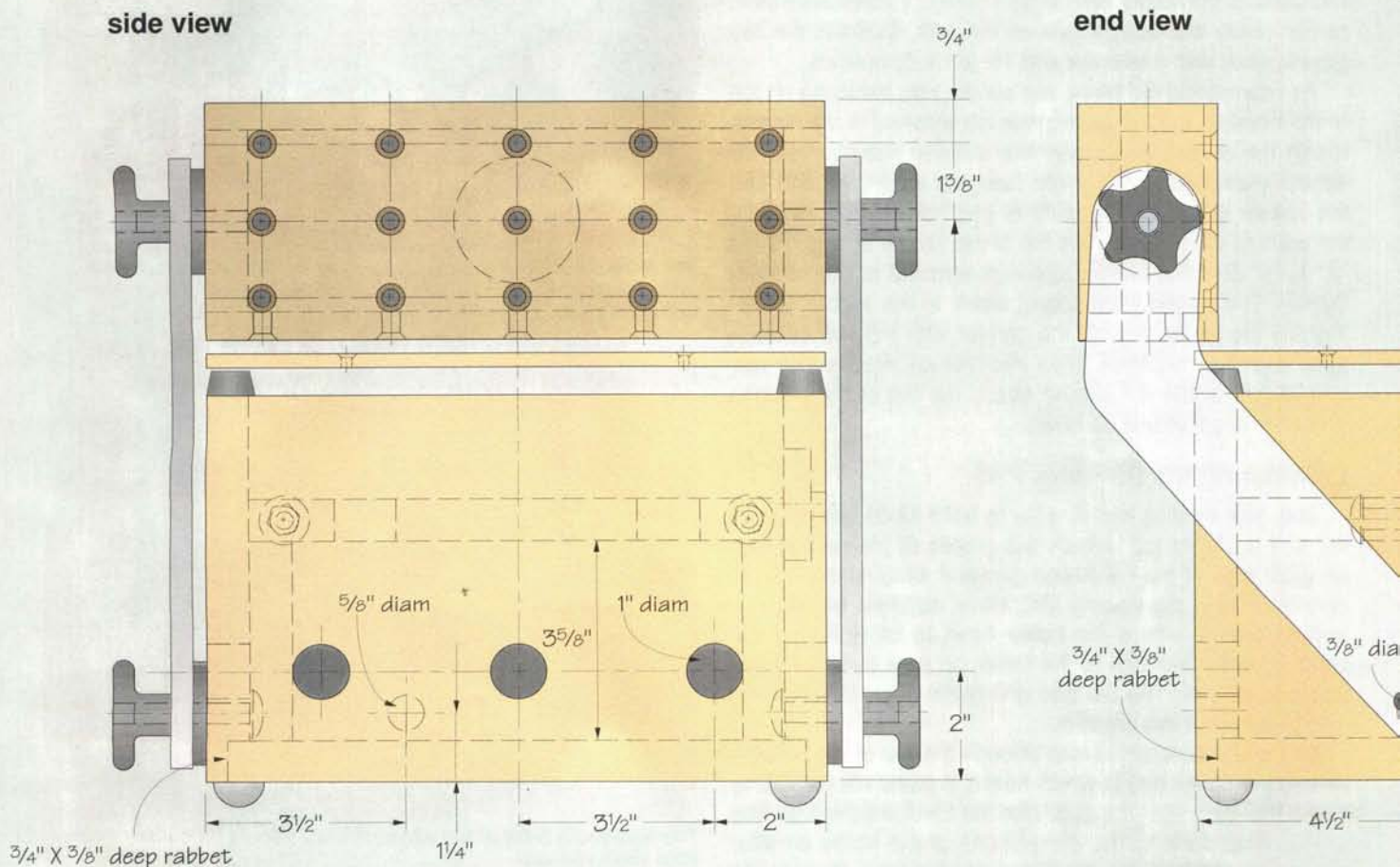
I wanted an adjustable fence so I could accurately sand the edges and end of work at any angle. I also wanted to eliminate as much fine dust as possible. I designed a unique vacuum fence that performs both of these operations at once. The vacuum fence is a hollow box the same length as the sander housing. The back and ends of the fence are made of 3/4" plywood, so they have the durability to support an inserted vacuum hose at the rear and two threaded rods at the ends. The top and bottom are made of 1/2" plywood, while the front is 1/4" hardwood plywood.

Cut the vacuum pieces (G–J) to the dimensions given in the Cutting List. It is held together with glue, nails, brads, and sim-

ple butt joints. Cut the hole in the back piece to accept your vacuum hose before the fence is assembled. The interior of the fence well is too narrow for a sabre saw after assembly. Assemble the fence and prepare the outside surfaces for a plastic laminate covering. Laminate the sander housing and be sure to indicate the back laminate so the hole for the vacuum hose can be trimmed later.

Drill through the back piece of plastic laminate so you can insert a router bit to trim the hole flush for the vacuum hose. Locate the center of each end of the fence and drill an $1\frac{1}{32}$ " hole with your drill press. They must be drilled straight. Screw a $\frac{3}{8}$ " bolt into each hole to help cut shallow threads in the plywood. Then remove the bolt and cut two $\frac{3}{8}$ " threaded rods 2" long. Threaded rods are screwed into the fence from the outside, since it is impossible to work with your hands within the fence. Apply a liberal coat of five minute epoxy on the surfaces of each hole and screw the threaded rods into the holes until $1\frac{1}{4}$ " remains outside. Allow the epoxy to cure completely.

Mark the centers of the 15 vacuum exhaust ports on the front and the 5 on the bottom of the fence, as shown in the top and side views. Mark the centers of the holes with a punch so the drill bit won't wander. Use your drill press to drill the 20 holes with a $\frac{5}{16}$ " bit. Drill slowly to reduce splintering on the interior of the fence. Use a countersink bit to taper each hole to about half the thickness of the plywood. Use your drill press depth stop to taper the exhaust ports equally. Sand the tapered holes with a small piece of sandpaper on the end of the countersink bit and lightly drill each hole.



Support Arms and Spacers

The inverted orbital pad sander and vacuum fence are built. Now they need to be tied together to form a workable unit. This is accomplished with two support arms that are attached to the protruding bolts located on the ends of the sander and fence. The arms permit the fence to be positioned laterally at any location across the width of the sanding pad. And the fence may be tilted at any angle to aid with sanding positions. Anti-slip spacers are placed on each bolt, under the arms, to prevent any movement of the vacuum fence after the knobs are tightened.

Transfer the PullOut™ Plan pattern to each arm blank (K) including the three hole centers on each. Cut the profiles with your band saw, and sand the edges smooth. Laminate both flat surfaces with plastic laminate. Trim the plastic laminate flush, then locate and drill the holes. Laminate only one side of the arms, trim flush, then laminate and trim the other side so the end of your router bit will have clearance to move properly.

The spacers move the support arms away from the orbiting pad and provide a positive lock when the knobs are secured. They are made from plastic laminate, laminated to obtain a 1/4" thickness. Cut, drill and sand the spacers (L) to the dimensions given in the Cutting List before you apply anti-skid tape to both flat surfaces. Press the spacers onto the adhesive side of the anti-skid tape and trim off the excess with a file. Drill a 3/8" hole in the center of each spacer. Assemble the housing, arms and fence with five star 3/8" thru knobs and the unit is ready to use.

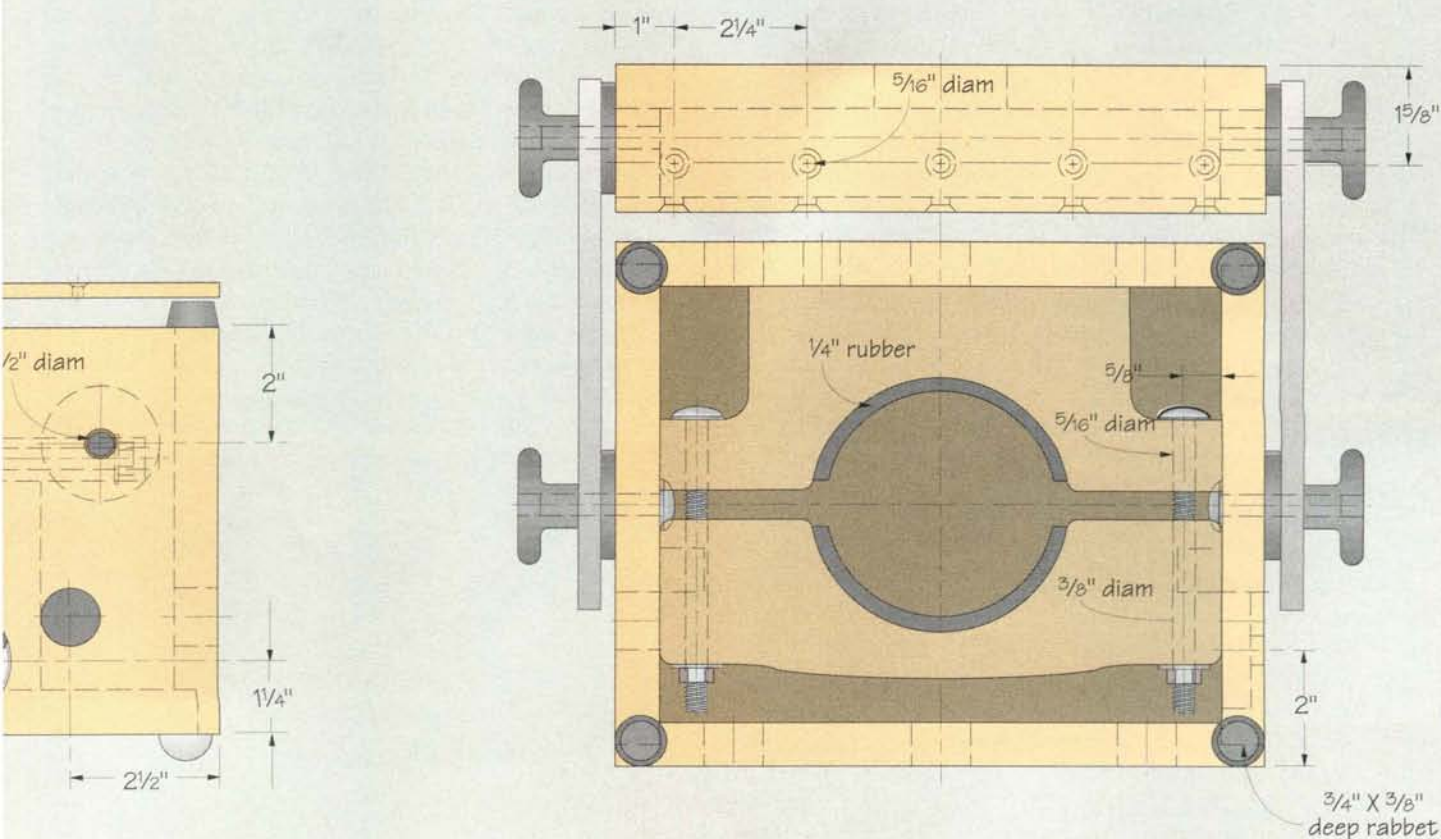


The vacuum fence is incredibly valuable when sanding small parts. It is easy to get edges that are square or precisely angled.

An Easy Decision

I doubt if I would have designed and built the inverted orbital pad sander and vacuum fence if my Rockwell model 505 hadn't been damaged. In fact, I probably wouldn't have thought of the idea. The decision to cut the handles from my already damaged sander was easy. This project worked great in my situation and my sander found a new home. **PW**

top view





Gary Wagner, San Francisco, CA

Large Ornamental Turnings

by Stephen Wesley
with Paul Spinetti

The rhythmic grinding of tool steel against wood echoes from the rear of the seemingly ancient woodshop. As the chips of poplar fly, a nondescript octagon gradually takes form. For wood turner Paul Spinetti it's another column being born. This Northern California artisan has seen many of his creations go into some of the finest homes and businesses in the country. And yet, every day at work is a new challenge and a new set of surprises.

Paul is a California native and has been associated with the woodworking trade for the past 17 years. He's been a cabinetmaker, carpenter, and a tool salesman. But it's been as a wood turner that Paul has found his greatest success and personal satisfaction.

Between his other wood oriented endeavors, Paul worked at his turning skills on his own time, making bowls and related objects to sell at various art fairs. However, Paul wanted to make his turn-

Stephen Wesley is the office manager at Haas Woodworking where he's worked for 10 years.

ing a career and found that opportunity at Haas Woodworking Company in San Francisco. "I wanted to work here because it is a well established and highly respected shop. In our area, if you can say you work at Haas, it says a lot about the quality of the work you can produce."

The Haas Woodworking Company is a 107 year old wood shop located almost in the heart of San Francisco's financial district. "I can't tell you the number of times that people in power business suits come into our office and say they never knew a shop like this existed downtown," says company VP, Irene Haas. "We take a lot of pride in the part we've played in the building and maintaining of San Francisco's architectural tradition. Having the good fortune to find a quality employee like Paul has allowed us to continue an almost forgotten craftsmanship into the next century."

The company was founded in the early 1880's by a German immigrant named Carl Haas. His original company, San Francisco Woodturning Co., later grew into Haas Wood and Ivory Works. Through a depression, a few recessions, changes in architectur-

al preferences and two major earthquakes, the four generations of Haas woodworkers have held to the quality that Carl first brought to San Francisco.

Where their work has been installed reads like a who's who of celebrities and businesses. Haas products can be found in the offices and homes of such luminaries as Linda Ronstadt, Kirsti Alley, Goldie Hawn, Frances Ford Coppola, George Lucas, and Mark McGuire of the Oakland A's. Some of the companies that call on the Haas' workmanship include Macy's, Banana Republic, The Gap, and Lyons restaurants. The motion picture industry has also called upon Haas Woodworking to contribute to such movies as *Play It Again, Sam*, *The Right Stuff*, *Mrs. Doubtfire*, *I Married an Axe Murderer* and *Getting Even With Dad*. There was even a rock video filmed in the shop by the Greg Kihn Band.

"It's not hard to see why I wanted to work in this shop", says Spinetti, "Not Best of Show, Bay Area Woodturners, December 1992. Oak burl hollow vessel."



only do I have the opportunity to increase my skills and learn from a quality group of talented woodworkers, but I get an instant good reputation by association." Paul credits master wood turner Victor Lauteri as a major factor in his growth as an artist. "Victor has over 60 years of experience in this trade," explains Spinetti, "and his work is all over the world, even in the Vatican. Learning from him hands-on is like an art student being taught by Picasso or Van Gough."

Another factor in Paul's choice to work at Haas was the diversity of the shop's capability. "Let's face it, times have been tough in our industry. You can be swamped today and flat tomorrow." Haas Woodworking has always tried to be as diversified as possible to make itself slump proof. "I can go to work here in the morning knowing that if the woodturning is a bit off, the mill will pick it up. An if the mill is a bit off, the specialty products shop will pick it up."

Acacia bowl. *Hawaiian Koa is one of several species belonging to the genus Acacia.*



Paul explains that Haas as actually three shops in one. He's the key to the woodturning end. There is also a custom millwork division that specializes in curved moldings. The specialty woodwork division manufactures custom Victorian ornamentation and is headed by craftsman Paul Fong.

"We don't ever want to get caught in a limited niche", says Spinetti, "If a customer wants a project done, we'll tackle it. Our only requirement is that it be made out of wood."

The secret of the Haas success and longevity can be found in its versatility and flexibility. The shop has no set product line or pre-manufactured items. Every job is customized to the specifications of the customer's wishes. So, while every day is a new set of surprises and challenges (some very frustrating), Haas Woodworking is easily able to go with whatever trends or needs that arise as years pass.

Another company strength is its client base. Other wood shops, cabinet shops, and even woodturning or mill shops are some of Haas' best customers. By offering to make difficult but

unique wood components, other businesses can expand their custom products by purchasing items through Haas Woodworking that they may not be able to manufacture in their own shops.

Other woodturning shops use "the shop" to take advantage of Haas' speed, accuracy, and product size capacities. "I know several lathe shops that use our services regularly," notes Paul, "sometimes I feel like I'm employed by the entire industry and not just Haas Woodworking."

So, what began as a weekend hobby in Paul Spinetti's garage is now a full time profession. His columns, balusters, finials, dowels, and bowls now have an even greater clientele. "This is what it's about," says Paul, "doing the custom work I love and having the security of a solid company to work for." And what is the company's opinion of Paul? "He's very good", says president and company owner Robert Haas, "He wouldn't be working for me if he wasn't!" And that's what Haas Woodworking is all about. **PW**



News and Notes

New products to announce? Send a press release and a color photograph to the Editor, *Popular Woodworking*, 1041 Shary Circle, Concord, CA 94518, and we'll consider them for "News and Notes."



The 2.3 amp, 5" random sander (HD 7750) from Skil provides versatile sanding and polishing for a wide range of surfaces. The two speed sander (8000 and 11,000 opm) features a hook-and-loop style fastening for simple and quick

sanding sheet changes. Dust collection is handled by a through-the-pad suction system. The front handle adjusts for working in tight spaces and the adjustment wrench fits in a holder on the cord. Skil tools are available through home centers and hardware stores. S-B Power Tool Co—Tel. 312 286-7330.



The Titan Pro-Finish 400 HVL is designed for high production and industrial uses, such as custom woodworking. The unit utilizes a high volume of low pressure air, 6.5

psi and 130 cfm, to spray difficult to atomize coatings, including stains, oil base glosses and most latex paints. Overspray and bounceback are greatly reduced with HPLV technology. Titan Inc., 556 Commerce Street, Franklin Lakes, NJ 07417. Tel. 800 526-5362.

The Rip Master RM-2708 Table Saw Stand increases ripping capacity of portable table saws to a full 28". It's cam lock fence squares exactly to the blade for accurate cuts every time. The hand truck design and 10" stair climbing wheels provide easy transport and storage. Quick mount legs raise the saw to 36" and even adjust to uneven floors. Trojan Manufacturing, 9810 N. Vancouver Way, Portland, OR 97217. Tel. 800 745-2120.



Packed with plenty of power, the new Delta Deluxe 6" Jointer contains a 3/4" HP, 115/230V, 3450 rpm single phase motor. Its cast iron, wedge bed design has precision machined, dovetailed ways with adjustable "gibs" to minimize wear. The jointer houses a 2 1/2" diameter, 3-knife, ball-bearing cutterhead that turns at 4800 rpm for a smooth finish at 14,400 cuts per minute. A jack screw arrangement allows for easy knife setting or replacement. For more information, or the name of a nearby distributor call Delta International Machinery. Tel. 800 438-2486.



Dremel's new model 7390 Heavy Duty Flex-Shaft® Carving Kit combines the high speed, finger-tip precision and accessories necessary for the serious wood-carver. Included are the 732 Heavy Duty Flex-Shaft tool, 1" diameter hand piece (up to 1/4" shanks),



foot operated speed control, maintenance kit and a 27 piece assortment of accessory bits. The 1/5 horsepower motor gives a speed range from 0-20,000 rpm. Dremel—Tel. 800 437-3635, ext. 2.

DIGITAPE, from Starrett, is the world's first reliable, full function electronic tape that simultaneously performs as a premium-quality, contractor-grade "standard" tape as well. Users can choose from its many electronic measuring features by reading a large digital display, or by using the tape conventionally with the fully graduated rule. Features include the ability to display measurements as feet and inches, total inches and centimeters. Other functions include; freeze a measurement in memory and the ability to include the length of the case if desired. L.S. Starrett Company, 121 Crescent St., Athol, MA 01331. Tel. 508 249-5330.





Power-Hands™ Safety Pushstick distributes pressure forward to prevent kick-back, and downward, to prevent kickup. The grip keeps your hands 4" above the blade for added safety. The pushstick comes with two soles; one for flat stock and another

with a V groove to use on the corner of boards that allows you to keep the stock against the fence, especially on router tables. Tool Designs, P.O. Box 1318, Ashland, OR 97520. Tel. 503 488-3059.



Now you can make precise 90° cuts with your circular saw faster, safer and completely accurate time after time with the "Cheeter" crosscut saw guide. The Cheeter contains a unique calibration window and ruler that automatically

positions the saw blade for a straight, precise cut from either side of the cutting edge. The saw rests on the guide and the guide locks to the wood. Beckwood Industries, 889 Horan Drive, St. Louis, MO 63026. Tel. 314 343-4100.

The NOXON Inc. "No Hammer Needed!" line of wood-working hand tools is brand new. The nailsets and punches resemble standard tools, but the difference is the high quality spring. At first glance, you might mistake the spring for a good high-friction grip. In actuality, the spring connects a striker with the tool end or bit. Set the bit (nailset, punch, chisel or letter stamp) on the work, pull back on the striker and let go. No wood dents like when a hammer glances off the end of a nailset



—one pull and release, and the job is done. Every standard size of finish nail can be set with two, Two Bit Snappers. Spring Line Tools, N. 2921 University, Spokane, WA 99206. Tel. 800 356-6966.

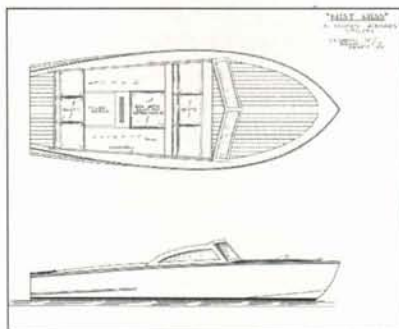
This spring, Pygmy Kayak Co. introduced two new versions of the GoldenEye (see page 55). The GoldenEye 13' is designed for smaller paddlers from 4'1" to 5'3". The GoldenEye 10' is sized to fit youngsters between 4 and 9 years old. Pygmy recommends lashing boat bumpers to the sides of the 10' during the training phase. These make it nearly impossible to overturn. Pygmy Boat Co., P.O. Box 1529P, Port Townsend, WA 98368. Tel. 206 385-6143.



Bosch's new line of high performance routers, featuring double-insulated housings and all ball bearing construction, are for use in heavy-duty construction and wood-working applications. The Model B1450 Electronic Plunge Router offers 12,000-22,000 rpm on 2 HP. The tool features a six-position, variable speed switch. The router comes with 1/4" and 1/2" collets and collet nut wrench. Optional accessories include 3/8" collet, deluxe router guide with fine adjustment, a metal case and various dust extraction accessories. Bosch power tools are available through home centers and hardware stores. S-B Power Tool Co., Tel. 312 286-7330.



Mist Miss is a practical, inboard runabout. This classic design makes it possible to create a traditional looking craft utilizing the ease of plywood construction. Powered with any of the popular auto conversions or high speed, light weight marine motors, the central location does not let weight affect the trim. In line with current ski boats, this design gives a control and wake that make it a preferred hull type for professional skiers. Glen-L provides plans and patterns for each frame, stem and transom. Glen-L Marine, 9152XPW, Rosecrans, Bellflower, CA 90706. Tel. 310 630-6258.



Specialty Sanders



It wasn't so long ago that there were only two types of power sanders available to the home-shop woodworker; a large belt/disk sander, which was a real luxury item, and stroke sanders. The oscillating drum sander was also available, but used mainly in commercial shops. All that has recently changed. The random orbit sander moved from the air-powered autobody shop to the electric-powered woodworking shop. As the market for these sanders increased so did the types of specialty sanders.

One type of sander to become increasingly popular is the detail sander, often called a corner sander. Initially it was available only through Fein, a manufacturer of expensive, premium quality tools. It has since been adopted by other tool manufacturers and competition has lowered the price of these tools and given the woodworker a number of options from which to choose.

The corner sander is a great idea, but I have mixed feelings about that whole class of tools. It makes it easy to perpetuate bad habits. It should be common practice to finish sanding a project before assembling it, but even the most experienced woodworker gets anxious and assembles the project before it's thoroughly sanded. The corner sander does help in those situations where further sanding is needed on assembled projects. Two new additions to the corner sanding arsenal and a major price cut by Fein have made this type of sander more available. I'm beginning to believe that maybe the habits were "bad" only before corner sanders became readily available.

***Hugh Foster** is a noted woodworking writer and a frequent contributor to *Popular Woodworking*. Hugh lives in Manitowoc, Wisconsin where he teaches high school English.*

Detail Sanders

The WolfCraft Corner Sander Attachment is available from Woodworkers Supply, part # 826-914, in catalogue #93, page 42. It's listed for \$28.95. The Ryobi Detailer is widely available; the only hardware store in my small town matches the \$44.95 price of the mail-order companies. The Bosch is just becoming readily available; the only catalog listing I could find (Tools on Sale/Seven Corners Hardware, Inc., 216 West 7th St., St. Paul, MN 55102, Tel. 800 328-0457) shows a price of \$84.95. The price of the Fein was reduced in mid-1993 from \$365 to \$275 list. The selling price usually ranges from \$190 to about \$215. The higher list price is offset by the fact that abrasives for the Fein are markedly less expensive than those for the other sanders.

Along with price differences, there are significant differences in the design of the paper. Bosch and Fein papers have convex edges on each side of the triangle. Ryobi papers are triangular with each of the triangle's points squared off. WolfCraft's papers are diamond shaped. The Bosch abrasive pad is nearly 1/2" larger on each side than the Fein.

It's worth noting that Bosch, Fein and Ryobi papers have a more precise fit on their sanding heads. WolfCraft and Bosch abrasives are hook-and-loop and Ryobi is adhesive-backed. Fein offers a choice of either, or both, if you buy a second sanding head. In the long run, the more costly hook-and-loop paper is actually less expensive, particularly when changing grits before the abrasive on the paper is worn out. This operation is easy with hook-and-loop paper, but nearly impossible with adhesive backed abrasives. In extended use, the Bosch or Fein are likely to be the least expensive to operate because of they use hook-and-loop abrasive and have three corner



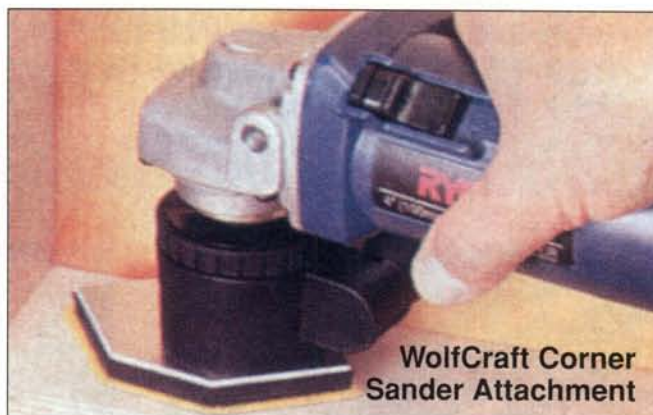
Ryobi DS1000



Bosch B7000



Fein MSX 636



**WolfCraft Corner
Sander Attachment**

pads, rather than just two like on the WolfCraft.

When I ran the sanders on unplanned stock, I noticed that the hook-and-loop paper moved slightly. Ryobi's adhesive backed paper was the only test material that stayed precisely in place. However, this slippage problem didn't occur when I tested the sanders on actual projects.

It's not really fair to measure the WolfCraft for noise because it's basically that of the motor in your existing angle grinder. My new Ryobi grinder runs around 90 dB with the WolfCraft corner sander accessory on it. The Ryobi sander runs at 84 dB (82 dB at four feet), and has prompted some to call it "buzzy". It sounds like a loud electric hair trimmer. The Fein runs at 82 dB (76 dB at four feet). The Bosch's noise level is 84 dB, but it seems much quieter than the Ryobi. Scientifically speaking, we might call the 2 dB difference between the Ryobi and the Fein negligible; but practically speaking, the Fein's noise isn't nearly as objectionable. It sounds like a high quality food mixer and it's the only one of the three I'd care to be around in regular use. Tools don't have to be obnoxiously loud; some tools are loud because we have accepted the noise rather than demand better engineering. Someone else could use the Fein in my shop without forcing me to wear ear-protection.

Related to noise is the level of vibration you feel with the tool. The feel of the WolfCraft depends on your angle grinder. When attached to my grinder it was the hardest to control. The Ryobi is even more "buzzy" to the touch than it is to the ear. It has a fine-interval shake, like pad sanders had in the 1950s. The Fein is very smooth and is the only tool I'd care to use for more than short intervals without using anti-vibration gloves. The gloves are highly recommended for most

sanding operations to help avoid carpal tunnel and related repetitive motion disorders.

I'm a dust collection fanatic, but the Fein dust kit renders the form-fitted case useless and makes the tool hard for my small hands to hold. The tool raises little dust and I feel perfectly safe using it without the attachment. The Bosch sander is packaged with its own AirSweep® hose so there's no need to buy any dust collecting accessories.

There are many accessories available for the Ryobi, but dust collection isn't among them. The standard pack that comes with the tool contains one each of the five grits of abrasive, a stripping pad and an adhesive backed foam polishing pad. These parts are available and are relatively inexpensive, even in my local, small-town hardware store. Also available for the Ryobi are rust removal/metal finishing pads, a very fine wood abrasive (similar to a very fine grade of 3M Scotch-Brite™), and a very interesting scraper head. Except for the scraper head, these accessories are also available for the Bosch. The Bosch also comes with an accessory extension pad that makes shutter sanding easier than the other sanders.

Ease of use is an important consideration. The Ryobi is by far the lightest and the handiest. The switch is operated with your little finger, and the tool is comfortable to use both left- and right-handed. The Fein is okay left-handed, but a positive delight right-handed. The body can be turned 180° for excellent left-handed operation. The Bosch comes with a top mounted switch which makes it ideal for right- or left-hand operation. As the newest market entry, the Bosch has been designed by people who have undoubtedly had an opportunity to play with the others. It doesn't need a special tool to turn

the triangle and front a new grit into the work. The abrasive holder on the Bosch is a snap-on accessory. Little things like this and the built-in dust collector really help to make this tool user-friendly.

The Wolfcraft will be preferred by the woodworker who has a seldom-used angle grinder. It's the least expensive entry in the field. While this attachment has had little attention here compared to the integral units, it does the job better than most of us are likely to do sanding with only our fingers. It's easy to recommend this unit to the economy minded woodworker.

In many ways, I think I'm treating Ryobi worse than I should be; but, it's only realistic to expect it to be third best, considering it's less than a quarter to half the price of the others. The realistic question isn't whether the Fein is better, but whether it's \$150 better. If you use the tool day in, day out,

the price will be long forgotten while the quality holds. If it's a tool that will see no more than half an hour of use a week, the Ryobi is probably all you need.

Bosch enters the market at an interesting point. It's nearly as smooth as the Fein, which is more than twice as expensive; and it's not nearly as "buzzy" as the Ryobi, which is less than half as expensive. All things considered, the tool is far more like the Fein than the Ryobi. It's a good buy, and it may cause another drop in the price of the Fein. This is the tool I would buy, unless I had to run it all day. I've had a Fein sander for a few seasons, and I know that I can run it all day. Nevertheless, unless you run it all day, every day, the Bosch is your tool of choice; still, choose the Fein for ultimate comfort in use. It's not often that I can recommend, in good conscience, a tool other than the one I most prefer, but the Bosch provides the most bang for the buck.

Manufacturer	Model Number	Country of Manufacture	Paper Area	Paper Backing	Amperes	Orbits / Minute opm	Weight	Dust Collection	Noise Level
Bosch	B7000	Switzerland	≈6 sq."	Velcro	1.1	13,000	2 lb.	Standard	84 dB
Fein	MSX636	Germany	≈4½ sq."	Either	1.35	20,000	3 lb.	Optional	82 dB
Ryobi	DS1000	Germany	≈3½ sq."	Adhesive	.24	7,600*	< 2 lb.	None	84 dB
Wolfcraft	None	Germany	≈6⅞ sq."	Velcro	**	**	**	None	90 dB†

*Ryobi calls this strokes/minute. **Dependent on the grinder used. †When used on a Ryobi grinder

Abrasive Plane

The next sander reviewed isn't considered a sander by its manufacturer. The Porter-Cable 320 is a portable planer that uses a sanding drum instead of costly, fragile knives. It's superior to other kinds of portable planers for finishing the edges of corners and repairing wood surfaces. Unlike regular portable planers, this unit is great for use on endgrain. Its action is abrasive rather than cutting and it removes material that other portable planes won't.

Portable power planers are useful not only in framing and finish carpentry, but also in shop-based woodworking. Among their many field uses are straightening and tapering studs, joists, rafters and beams. Further uses are cleaning up old stock, fitting doors, hanging siding, removing saw marks and fitting trim. They get lots of field use since building materials often aren't very square, and allowances must be made for the work of other crafts people. The uses are so many that nearly everyone who works on a building project involving wood will find the tool very useful.

The Porter-Cable 320 has been around long enough to be popular. The manual cautions: *"Due to the unique design of the Abrasive Plane, RIGHT HAND OPERATION IS MANDATORY in order to maintain safe operating conditions. It is intended for the plane to be used with the right hand. The design of this machine is not suitable for operation with the left hand, nor does it provide grasping areas for use as a two-handed machine."*

Like about twenty five percent of all woodworkers, I'm



left-handed. I don't like the hand position or the shortness of the base. It seems to me that a left-hander would do as well and as quickly with a belt sander, and most of us already have one of those. On the other hand, years of popularity appear to indicate that I am wrong about this. Right handers who have tried the Porter-Cable 320 in my shop have loved it and because I've never used a bad Porter-Cable tool, I'll take their word for it and pass it along.

Oscillating Spindle Sander

The Ryobi OSS450 is the first tool of its kind to be popularly, or affordably, available for the small shop or hobbyist woodworker. It's readily available for about \$175—the nearest competitive product is nearly four times the price and weight.



A 3.5 amp motor powers the machine at 2000 rpm and 58 opm. These numbers may not sound like much, but the tool is a real powerhouse. This tool is as acceptable for the home shop as the commercial unit I occasionally use at a friend's business. The 14" by 20" plastic laminated MDF top is big enough for most home shop uses and the injection molded base should be strong enough to last a good many years. The dust hose nozzle appears too small to work, but it collects as well as any pick-up I've used. At 26 pounds, it's only a fraction of the weight of a commercial unit. This is a bench top tool, not a professional stationary unit.

The oscillating range is $\frac{5}{8}$ ", so the belts can sand material only up to $3\frac{1}{16}$ " thick, even though the sleeves are $4\frac{1}{2}$ " tall. The 1" sleeve is standard; the $\frac{1}{2}$ " sleeve requires only the nut to hold it in place; $\frac{1}{2}$ ", $\frac{3}{4}$ ", 2", and 3" are optional sizes.

Throat plates for all the spindle sizes are standard, but the rubber drums are sold as an optional accessory. A set of drums runs about \$35. The sleeves are packaged and sold in a variety of ways. Unless you already know what you want, I recommend buying a set of each grit—coarse, medium, and fine—in each size.

At first, I was disappointed to see the sleeves sold the way they are; after all, pre-made sleeves are quite expensive, especially when compared to the ones I make for the drums I use on my drill press. The disappointment passed the instant I changed grits. I was able to change grit and/or size in well under a minute, and the change was easy—I can't imagine going back.

According to my Radio Shack sound level meter, the tool runs at 85 dB; though it sounds much louder than some tools that measure higher. I found I was more comfortable wearing ear protection while I operated the tool.

My most rigorous test was to pass a rough-sawn edge of a cherry board over the 3" coarse sleeve. The result was as good as a pass over the jointer. The fuzz on the edge was gone, and it left no machine marks. I'm confident that the OSS450 will be greatly appreciated in the small shop. Scroll and jigsaw users are sure to love this tool. The oscillating action solves the heat build-up problem and alleviates troublesome burning and glazing on the edges. It removes stock faster than a standard, drill press mounted drum sander, and the sleeves last longer. The tool gives a better finish and

squarer edges than you're likely to get from hand-controlled sanding methods.

The manufacturer recommends that the tool be securely fastened to a bench top. The height from the base to the table is $13\frac{3}{4}$ ", making it too tall for my 39" work benches. A 30" bench height would be ideal for me.

Power File

Last in our survey is a specialty sander that may well represent the best bargain of the batch. The British made Black & Decker Quantum BD 5900 is the most unusual belt sander I have ever encountered. It's $\frac{1}{2}$ " wide with an 18" belt and is powered by a 2.8 amp variable speed motor which moves the belt at 3300 to 4900 fpm. According to my Radio Shack sound level meter, the sander runs between 85-88 dB, depending upon the speed. There's a speed control switch, a lock-on trigger, and tracking and tension adjustments. Even without instructions, you can figure out how to operate this simple tool in a matter of moments. Belt changing on the BD 5900 is easier than any other belt sander I've used.



Dust collection is part of the basic design, rather than an afterthought. While any dust collection is better than none at all, it's rare that we find a system of this quality even in an expensive machine. To find it in a tool of this cost is a treat; to find it so integral to the design deserves special mention. Dust collection joins a host of other features to make this tool an incredible value at under \$70.

Need a square hole? Drill a $\frac{7}{8}$ " or larger hole, then bring it quickly to shape by working the BD 5900 inside it. I'd never have dreamed of doing this with my standard belt sander; but this one's belt is only $\frac{1}{2}$ " wide, and the total drive mechanism is just shy of $\frac{7}{8}$ " thick. There's a terrific 2" platen on the underside of the arm for the sanding belt to rub against. Practice on some scrap stock, for this sander removes material in a hurry and its uses are extensive.

Conclusions

Reviewing the whole list, I'd recommend that you consider adding sanding tools to your repertoire in this order: first, buy the detail sander that best fits your budget; then add the Quantum BD 5900; then the oscillating spindle sander; finally, a portable plane like the Porter-Cable 320 makes a lot of sense for right-handed woodworkers. If you like making projects more than you like making an effort, these tools are a great help. **PW**

Osage Orange

For a wood with such a tough disposition and convoluted history, osage orange is still worth considering for use in some woodworking projects. Indeed, some of its attributes make it a highly desirable native hardwood in specialized applications.

General Description

There is only one osage orange, a tree indigenous to the south central United States and a member of the mulberry family of trees. Osage (*maclura pomifera*) has, however, spread far from its native habitat and can now be found north to the Great Lakes and east to the Appalachian Mountains.

The tree's name is a complicated, and sometimes contradictory story in itself. Part of the name comes from the Osage Indians of the Arkansas/Oklahoma / East Texas area, which was the tree's native habitat. But the orange part of the name seems a bit more in doubt. Some say it's because of the tree's bitter fruit, an ugly green globular item that's about the size of a real orange. Others contend part of the sawn wood's range of color helped give the tree its name. Still others contend the second half of the name came from an Anglicized corruption of French explorers' first name for the wood, *bois d'arc*.

In any case, the wood has plenty of nicknames today, including more corruption of that original French name. Osage orange is often called bodarc or bodock wood. It's also called bow wood, mainly because it was a highly prized wood for making archery bows. Indeed, a rough translation of *bois d'arc* is "wood for bows."

It's also called hedge wood or fence

wood, which helps tell the story of why osage is as common today in Ohio as it is in Arkansas. It is also called hedge apple or horse apple tree.

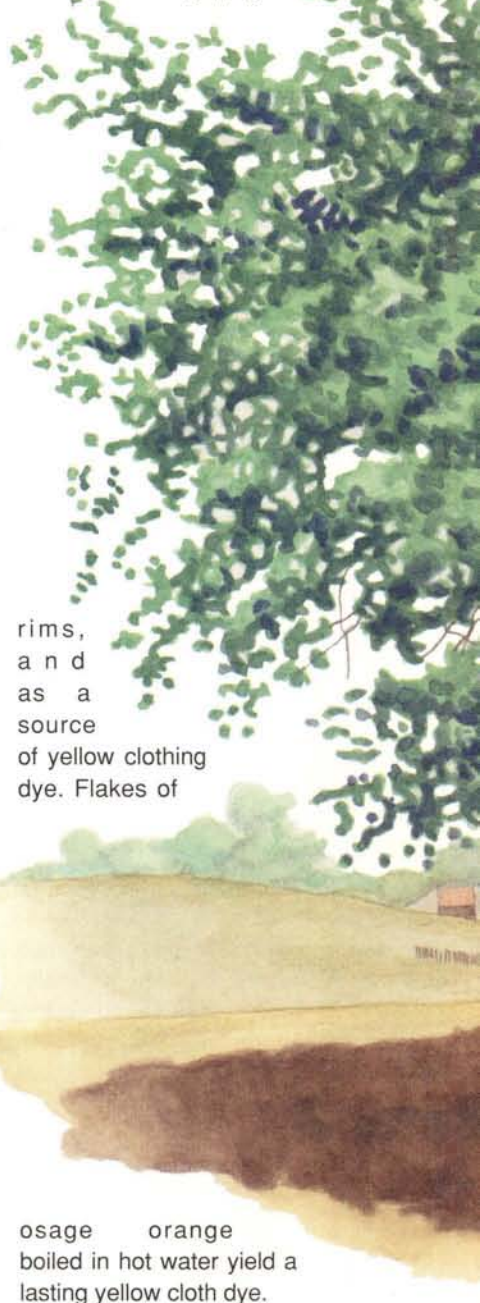
Before the invention of cheap barbed wire fencing, early settlers in the Midwest needed a means of enclosing their land. Osage orange trees were used because they grew quickly and reliably from shoots, roots, seeds or graftings. Moreover, the tree grows in a variety of soils and is somewhat bushy in its growth patterns. Its branches are also full of thorns, which help keep cattle from trying to charge through an osage hedge row. Thus it was easy to create huge fences of osage orange hedgerows, many parts of which can still be seen in Midwestern forests today.

The tree is of medium size, rarely reaching a height of more than 60 feet. Branching begins low and there are sharp, intermittent spike-like thorns on most branches, becoming more numerous on the outer branches. The fruits grow throughout summer and drop in October. Osage orange prefers well-drained soils, from bottom lands to uplands. When cut, it exudes a milky sap that is a skin irritant to some people.

The wood is hard and heavy, with a tendency to be cross-grained and tough. The sapwood is whitish, but confined to an inch or so of the outermost growth rings and therefore it is rarely found in finished lumber. The heartwood is bright yellow when first cut, darkening to orange and then orange brown when exposed to sunlight. The grain is closed, medium fine and often interlocked. This contributes to an interesting grain pattern. In fact, the manner in which osage's herringbone grain catch-

es and reflects light is reminiscent of a hologram. Osage's tough grain and beauty is very much like American elm (*PW*, Nov. 1987).

Unlike elm, osage orange is highly rot-resistant, far exceeding the decay resistance of woods like cypress (*PW*, Sept. 1993) and mesquite (*PW*, July 1993). It is very shock resistant, strong and flexible. Its stability is widely variable, but generally considered poor because of the wood's grain inconsistencies. In addition to its traditional use in archery bows, osage orange has been a source of tent stakes, posts, slack cooperage, tool handles, railroad ties, wagon wheel hubs and



Ken Textor works wood and writes about it in Arrowsic, Maine.

Working Properties

Unless you can find very straight-grained planks, working with osage will be a challenge. The average plank is difficult to plane, largely because of grain irregularities. This causes tears and gouges even when taking off as little as 1/16" with each pass. Razor sharp blades are essential and taking off 1/32" in the final phases of planing helps reduce chipout.

The grain irregularity also makes it difficult to get problem-free routing, shaping and joining. Sanding out

the defects generally brings excellent

sandpaper, the closed-grain surface finishes extremely smoothly. Osage is, however, a fairly dusty wood, almost as bad as mesquite. A dust mask is essential at all times. Allergic reactions to the wood are minimal and freshly sawn osage has a musty sweet smell.

Cross cutting osage on a circular saw may leave a ragged edge. You can compensate for this by scoring the line before you cut. In ripping, the erratic grain occasionally forces the wood to bind up on a circular saw blade. But boring is problem free. Turning generally brings very good results. The turned surface is easy to bring up to a very smooth finish. However, as with planing, there is the risk of tearing out in cross-grained areas. Again, sharp tools and removing just a little wood at a time minimizes this problem.

Osage holds fastenings extremely well, resisting splitting much like elm. But

you must use properly sized pilot holes.

Even though the wood generally won't split when putting a fastening through an undersized pilot hole, the fastening itself is likely to twist off or bend. Also,

osage contains chemicals virtually identical to the tannins in oak (*PW*, January and March 1991). Tannins react with iron fastenings, staining

the wood dark gray or black near the fastening. Even galvanized iron fastenings should be avoided if the wood will have any contact with water or be exposed to a damp environment.

All glues work well with osage. But because of its tight grain, glue pockets for epoxy are necessary. If aliphatic glue gets between a black iron clamp and osage, the resulting stain in the wood is difficult to remove.

Finishing

When finishing osage, you will have to take into account its tendency to darken when exposed to sunlight. Even varnishes specially made to block ultraviolet rays will not prevent this darkening process. So if you'd like the wood's grain to show up as best as possible, a clear finish that won't yellow is most appropriate. Some lacquers and acrylic finishes will fill this bill.

Of course, you can leave osage unfinished without the slightest concern for protecting it against rot. In outdoor applications, this is probably the best approach, although osage will take a coat of paint without much fuss. It will also take stains and dyes. If you decide to make a bow out of osage, the traditional finish is either wax (preferably bee's wax to assure a good grip) or oil everywhere except at the hand-hold.

Availability

The availability of osage orange is spotty at best, even in its native region. This is due to the tree's growth patterns, which frequently offer only short boards with widely variable grain. Also, because the osage tree is relatively short, it is frequently shaded out by taller trees and dies long before that particular stand of trees is ready to be harvested for lumber.

The difficulties in working osage makes the demand for the wood low. This pushes the price way up there for a domestic hardwood, usually somewhere between \$6 and \$8 per board foot for ungraded stock of random lengths and widths. Even in its native habitat of the southern Midwest, its rare for the price to drop much below \$6 per board foot. Those rare, clear, straight-grained planks of osage can be as high as \$10 a board foot.

It's also rare to find osage in dimensional stock, although some sawyers will put turning blocks aside. For turners, osage is known to have more than its share of burls. These, however, you'll have to find in the woods yourself. As for osage plywood or veneer, it is essentially non-existent.

Osage orange is a wood worth trying if only to see its characteristic bright, sunshine yellow heartwood. Working with osage makes you think of those hot summer days in the Ozarks. **PW**



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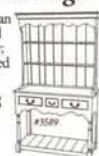
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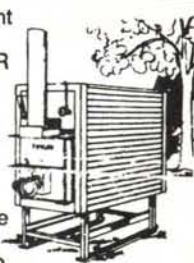
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Calendar

If your group is having an event you would like other woodworkers to hear about, please send us all pertinent information at least four months before the opening date. We will publish it for you here in our Calendar section free of charge.

California

Fine Woodworking Program of the College of the Redwoods presents the Annual Student Exhibition: (5/14-6/6/94) Highlight Gallery, 45052 Main Street, Mendocino, CA 95437.

Contact: For further information contact the gallery at 707-937-3132 or the shop at 707-964-7056.

Decoy and Wildfowl Carver's Association: (10/7-9/94) The 1994 Wildlife Art Show and Wildfowl Carving Competition at the Doubletree Hotel, Orange, CA.

Contact: Lloyd MacBride, PO Box 8215, Hemet, CA 92545, Tel. 909-845-2237.

Kansas

International Wood Collectors Society Annual Meeting: (8/7-11/94) Wood and woodcraft auctions, wood-working demonstrations, woodcraft displays, wood sample sales and swap.

Contact: Allan Ingle, 217 N. W. 35th St., Topeka, KS 66617.

Massachusetts

Woodworking Workshops: (4/4-8/10/94) One Cottage Street School of Fine Woodworking and UMASS Division of Continuing Education are offering a large variety of

woodworking classes, Easthampton, MA.

Contact: Michael Coffey, One Cottage Street School of Fine Woodworking, One Cottage Street, Easthampton, MA 01027, Tel. 413-527-8480.

Eastern States Craft Festival: (10/22-23/94) Eastern States Exposition, West Springfield, MA.

Contact: United Crafts Enterprises, Ltd., Box 326, Masonville, New York, 13804 Tel. Stan Rabbiner 607-265-3230 or Donald Allen 607-748-5224.

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Contact: Ray Larsen, Genuine Forgery, Inc., 1126 Broadway, Hanover, MA 02339, Tel. 617-826-8931.

Michigan

Tillers International: (10/3-8/94) Classes in Timber Framing and Raising Timber-frame Structures.

Contact: Richard Roosenburg, Tillers Intl., 5239 S. 24th St., Kalamazoo, MI 49002, Tel. 616-344-3233.

Montana

Good Wood Show V: (9/30-10/2/94) Competition: beginner, novice and open; Prizes: cash and ribbons.

Contact: Beth Husband, 2919 Lynn Ave., Billings, MT 59102, Tel. 406-656-2051.

New Jersey

Peters Valley Craft Center: (6/3-8/26/94) Courses include topics such as, Basic Woodworking, Finishing, Upholstery, Furniture Design and many more.

Contact: Peters Valley Craft Center, 19 Kuhn Rd., Layton, NJ 07851, Tel. 201-948-5200.

North Carolina

John C. Campbell Folk School Workshops: (4/10-7/2/94) Courses include topics such as, Basic Carving, Woodturning and Toolmaking.

Contact: John C. Campbell Folk School, Rt. 1, Box 14A, Brasstown, NC 28902, Tel. 800-FOLKSCH, 800-365-5724.

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Pennsylvania

Pennsylvania Crafts Festival: (8/10–11/94) Grange Fairgrounds, Wrightstown, Bucks County, PA.

Contact: United Crafts Enterprises, Ltd., Box 326, Masonville, New York, 13804, Tel. Stan Rabbiner 607-265-3230 or Donald Allen 607-748-5224.

Tennessee

"Woodturning: A Tribute to the Osolniks": (10/20–22/94) Arrowmont School of the Arts and Crafts.

Contact: Sandra Blain, Director, Arrowmont School, PO Box 567, Gatlinberg, TN 37738, Tel. 615-436-5860.

Virginia

Sugarloaf Mountain Works: (9/9–11/94) Featuring 335 professional artists and craftspeople. Prince William County, Manassas, VA.

Contact: Sugarloaf Mountain Works, Inc., 200 Orchard Ridge Drive, Gaithersburg, MD 20878, Tel. 301-990-1400.

Canada

Markham Wood Show: (9/9–11/94) Markham Fairgrounds, Mc Cowan Road, 7km North on Hwy. 7, R.R. #2, Markham, Ontario, CANADA, L3P 3J3 (Near Toronto).

Contact: Cyderman Productions, 136 Thames St., Chatham, Ontario, CANADA, N7L 2Y8, Tel. 519-351-8344.

North Bay Wood Show: (9/19–21/94) Memorial Gardens, Chippewa St. between Cassells and Fisher St., North Bay, Ontario, CANADA.

Contact: Cyderman Productions, 136 Thames St., Chatham Ontario, CANADA, N7L 2Y8, Tel. 519-351-8344.

Edmonton Wood Show: (9/30–10/2/94) Northlands Agricom (Hall A), 118th Ave. between 82nd and 66th Streets, Edmonton, Alberta, CANADA.

Contact: Cyderman Productions, 136 Thames St., Chatham, Ontario, CANADA, N7L 2Y8, Tel. 519-351-8344.

Popular Woodworking's

CAPTION THE CARTOON

Contest sponsored by **SKIL®**

Submit your caption(s) for this cartoon on a **postcard** to *Popular Woodworking*, Cartoon Caption #7, 1041 Shary Circle, Concord, CA 94518. The deadline for entries is August 1, 1994. Entries will be judged by the woodworking staff. A winner and two runners up will be chosen.



The two runners up will receive a one year subscription to *Popular Woodworking*. The winner receives the new Skil 8" Drill Press, model 3380. Features include: 1/4 HP induction motor, 5 speeds (620-3100 rpm), adjustable depth stop, 1/2" chuck with 2" spindle travel and 7" chuck to table clearance—10" to the base. There's a conveniently located chuck key holder and a drill bit storage compartment for 20 bits (1/64"–1/2"). The warranty is for 2 years.



AND THE WINNER IS...

The winner of our "Caption The Cartoon Contest #5" in the March, 1994 issue, and recipient of the DeWalt DW682K Plate Joiner shown there is:

Jo Hilpert, from Columbus, Wisconsin

The runners up receive a one year subscription to *Popular Woodworking*.

John Chambers, from Etobicoke, Ontario

"Having a bad square day, Harry?"

Don Jennings, from Des Moines, Iowa

"So Bill, how long were the grandkids here?"

Get Those Lines Straight

Now, who says that only women manipulate to get what they want?

Before marriage, "lines" are often used by men as come-ons to get a date. In fact, there are as many different lines as there are men. These can range from the trite, "Hey baby, what's your sign?" to the more creative, "Weren't you Michelle Pfeiffer's stand-in for the movie *Batman*?"

Basically, men use these lines to get sex. After marriage, when sex is free and available, the inherent need for challenge takes over, and men progress to the next phase of testosterone satisfaction...Tools!

You think I'm kidding? How about this one? "Honey, this isn't a tool you use a lot, but when you need it, you really need it!"

Our basement looks like "Screwdrivers 'R Us!" We have screwdrivers with Phillips' heads, Robertson heads, flat heads, rubber handles, long handles, short handles, yellow handles, green handles, red handles, crooked handles, J power handles...help me, I can't stop!

What logical group of men thought this up? Who were Phillips and Robertson, anyway? They most likely invented

these screwdrivers as part of a plot to retire to Tahiti. I bet they use one flathead screwdriver to fix everything that breaks and laugh at the thought of North American men agonizing over whether to use a Robertson green or red, or a Phillips #2 or #3.

It's the tool rationalization lines that get me, though. "I passed up this tool last time it was on sale, and boy, do I regret it!"

Then there's the ever-popular, "Yes, I have several of these, but none in this size."

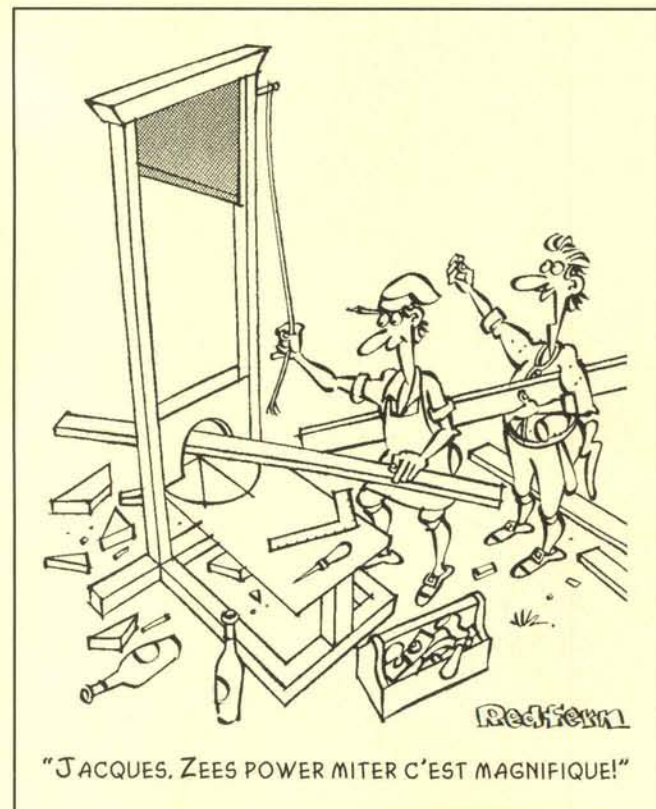
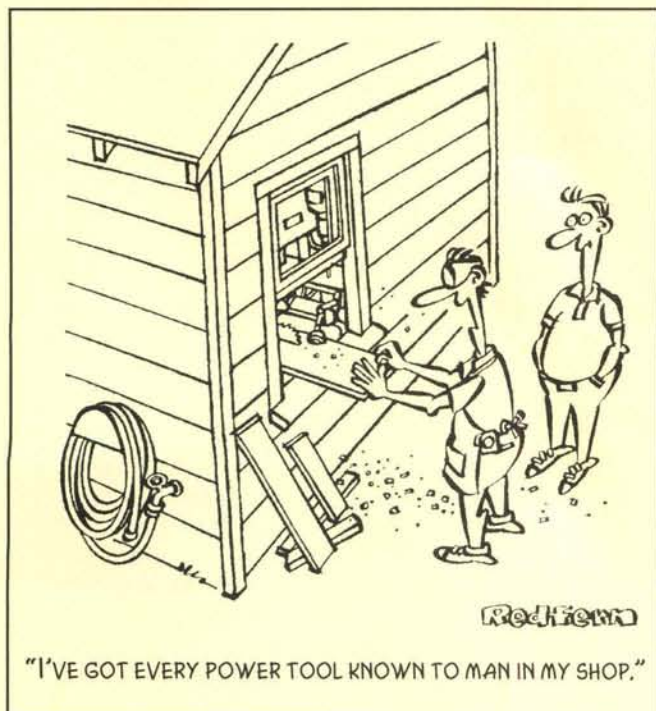
Or how about, "Having the right tools makes the job so much easier," or "I thought you'd love getting a reciprocating saw for our anniversary," or "I saw this written up in *Popular Woodworking*. They say it's a must!"

Women also use lines from time to time. I have one that I use for most everything. I simply look my husband lovingly in the eye and sweetly ask, "How much do you love me?" At this point, he begins to sweat. Upon discovering that I haven't lost or broken one of his tools, he's usually receptive to whatever I have to say and replies suspiciously, "What do you want?"

I respond with the female version of what comes after the quest for sex...Tupperware! **PW**

Dorothea Helms insists she's married to the Tim Taylor of Canada and writes about it from Sunderland, Ontario.

Welcome cartoonist **Doug Redfern** from Mill Valley, California. Doug's cartoons have appeared in such publications as *The Saturday Evening Post*, *Woman's World* and *Campus Life*.



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